PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

Vol. 109, No. 18 Thursday November 2, 1939 Price Ten Cents

11,380,814 Tons of Paper Produced in 1938

This Shows a Decrease of 11.3 Per Cent As Compared With 1937 When 12,837,003 Tons Were Produced In the United States — Production By Kind and Quantity and By Several States In 1938 As Compared With 1937

The tonnage of paper and paperboard produced in the United States in 1938 showed a decrease as compared with 1937, according to a preliminary report released by Director William L. Austin, Bureau of the Census, Department of Commerce. The production of paper and paperboard in 1938 amounted to 11,380,814 tons, a decrease of 11.3 per cent as compared with 12,837,003 tons produced in 1937.

All figures for 1938, as given in this report, are preliminary and subject to revision.

TABLE I.—PAPER AND PAPERBOARD—PRODUCTION, BY KIND AND QUANTITY, FOR THE UNITED STATES: 1938 AND 1937

[The schedules used in making the canvasses for the even-numbered years are less detailed than those for the odd-numbered years, and consequently some of the items in this table may not be strictly comparable as between the two years.]

Kind	Quantity (tons, 2,000 pounds) 1938	1937
Aggregate	11,380,814	12,837,003
Newsprint, total	832,331	975,854
Standard (in rolls and sheets)	828,267	
Other (special grades)	4,064	(1)
Ground-wood printing and specialty papers, total	435,651	518,332
Hanging	87,176	126,890
Catalog	91,782	100,974
Other	256,693	290,468
Book paper, uncoated	1,336,814	1,520,523
Cover paper	20,216	24,437
Writing paper, total	481,719	578,147
Rag content	69,468	78,367
Sulphite bond	304,282	332,229
Other chemical wood-pulp	107,969	167,551
Wrapping paper, total	1,865,856	2,053,387
Sulphite	[2] 367,104	[2] 565,985
Kraft	[2] 1,216,030	[2] 1,130,033
All other	282,722	357,369
Tissue paper, total	548,943	540,152
Toilet	264,380	254,221
Towel	104,951	93,284
All other	179,612	192,647
Absorbent paper	126,320	138,064
Building paper	570,454	608,086
All other papers	58,743	77,985
Paperboards, total	5,103,767	5,802,036
Container boards	2,631,318	3,167,550
Folding boxboards (bending)	1,221,047	1,289,024
Set-up boxboards (nonbending)	608,867	720,310
Binders board	34,241	51,913
Cardboard	47,371	51,318
Bristol board	52,223	73,539
Leatherboard	18,355	27,174
Pressboard	10,199	8,623
Building boards	118,124	110,005
Other boards	362,022	302,580

[1] Data not available.
[2] Not strictly comparable, due to change in classification as between the two years.

TABLE II.—PAPER AND PAPERBOARD—PRODUCTION, BY QUANTITY, BY STATES: 1938 AND 1937

[Statistics are presented in this table for each State for which separate figures can be published without disclosing the exact or approximate production reported by individual establishments. Larger quantities of paper and paperboard were, however, made in certain of the "Other Southern States" and "Other States" than in some of the States for which separate figures are given.]

State	Quantity (tons, 2,000 pounds) 1938	1937
United States	11,380,814	12,837,003
California	242,533	278,650
Connecticut	160,272	212,205
Delaware	35,314	36,389
Florida	273,048	(1)
Illinois	515,227	593,854
Indiana	183,547	295,981
Louisiana	468,808	533,977
Maine	882,171	1,038,775
Maryland	131,993	167,189
Massachusetts	439,499	514,039
Michigan	1,011,789	1,218,426
Minnesota	246,722	293,059
New Hampshire	140,739	158,924
New Jersey	626,274	640,207
New York	1,178,912	1,415,027
North Carolina	111,709	(1)
Ohio	827,340	1,037,884
Oregon	234,879	273,630
Pennsylvania	759,121	846,720
Tennessee	85,448	104,881
Vermont	70,700	82,071
Virginia	412,650	461,541
Washington	472,185	546,227
West Virginia	51,334	53,586
Wisconsin	882,445	940,867
Other Southern States [2]	798,267	938,378
Other States [3]	137,888	154,516

[1] Withheld to avoid disclosing data for individual establishments; included in figures for "Other Southern States."
[2] For 1938 and 1937; Alabama, Arkansas, Georgia, Mississippi, South Carolina, and Texas; in addition, Florida and North Carolina for 1937.
[3] For 1938 and 1937; District of Columbia, Iowa, Kansas, Missouri, and Rhode Island; in addition, Colorado for 1938 only.

Rushmore Strike Is Settled

GOUVERNEUR, N. Y., October 28, 1939—Announcement is made here of the settlement of the strike at the Rushmore Paper Mills following a meeting of officials of the company and representatives of the union. James C. Wemyss, superintendent of the mills, returned here early this week after attending the conference held at Albany and stated that work would begin immediately to prepare the machinery for resuming operations. He would not disclose the terms of the agreement, waiting for further meetings with officials of the company and the union. As soon as the machinery is placed in working order the manufacture of paper will begin with a portion of the working force.

Mill Activity Up 22 Per Cent In Six Months

D. C. Everest, President of American Paper and Pulp Association and Head of Marathon Paper Mills Comments On Improved Business—E. L. Saberson Made Director of Masonite Which Opens New Mill In Jan.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., October 30, 1939—Improved conditions in the paper industry because of hostilities in Europe were outlined in a statement issued last week by D. C. Everest, president and general manager of the Marathon Paper Mills Company, Rothschild, Wis.

The critical situation abroad, with its attendant threat to boost the price of paper, has sent paper mills in the United States into high gear during the last few months, Mr. Everest said. Mills throughout the nation a week ago were operating at 92 per cent of their theoretical capacity, the highest mark since 1933, barring a short spell in 1937. This is an increase of approximately 22 per cent in the last six months.

Most of the mills are now operating six days per week as compared to short weeks of three and four days a few months ago.

Effect of "Boom" Widespread

The effect of the boom has not been as noticeable at the Marathon mills as at others throughout the state and nation, Mr. Everest declared, because the Rothschild plants have been enjoying a sustained market. While many mills have added shifts, the Marathon mills have been operating 24 hours per day.

Though working hours and payrolls have increased, the number of employees has not risen appreciably because, Mr. Everest stated, the paper industry has consistently maintained the highest rate of employment of any industry. When work slackens, working days and hours are decreased but full crews are kept on the payrolls.

Mr. Everest feels the impetus in the paper industry has been caused by speculative buying by those who feel the war and a possible curtailment of foreign pulp will send prices soaring. The orders which began piling in shortly after war was declared in Europe slackened off during the last two or three weeks. The boom will undoubtedly last through December.

Marathon mills are not affected by the cutting off of the foreign pulp wood supply by the war, because, like many other mills, the inventories will carry them at least through 1940. Marathon and other mills also control many stands of timber from which to draw a continuous supply.

E. L. Saberson Made Masonite Director

E. L. Saberson of Chicago, was elected to the board of directors of the Masonite Corporation at the annual meeting of stockholders at the home office in the First American State Bank building at Wausau, Wis., Friday of last week. He succeeds Ernst Mahler, executive vice-president of Kimberly-Clark Corporation, Neenah, Wis. Mr. Saberson served during the last year as vice-president in charge of merchandising, and was re-elected to that office by the board.

All of the remaining officers were re-elected as follows: President, Ben Alexander, Chicago; vice-presidents, D. C. Everest, Wausau, Wis.; W. H. Mason and J. H. Thickens, Laurel, Miss.; secretary, Aytch P. Woodson, Wausau, Wis.; treasurer, M. P. McCullough, Chicago; remaining directors, C. J. Winton, Jr., Minneapolis; C. H. Worcester, Chicago, and C. C. Yawkey, Wausau, Wis. John M. Coates, Chicago, was elected assistant secretary to succeed H. B. Watkins, Chicago and Ben O. Anderson, Chicago, was re-elected auditor and asst.-treasurer.

Capacity of the corporation's plant at Laurel, Miss., was increased 33 per cent during the last year, President Alexander reported to the stockholders. The increase amounted to 100,000,000 feet of pressed board, bringing it up to 400,000,000 feet, with a daily capacity of 100,100,000 feet for a 24-hour working day.

The financial report showed that net sales during the fiscal year ending August 31, 1939, amounted to $7,233,389.77, and that the profit for the year after deduction of $92,095 for dividend requirements on 18,419 outstanding shares of preferred stock, amounted to $1,070,954.72. This was equivalent to $1.99 per common share on 539,210 shares outstanding. The profit for 1938 amounted to $1.94 per share.

New Canadian Masonite Plant To Open Soon

Operations are to be further increased after January 1, when the plant now under construction at Gatineau, Quebec, is completed. It will be ready for operation by the first of the year, Mr. Alexander reported. It will be operated by the Masonite Company of Canada, Limited, a new corporation owned jointly by the Masonite Corporation and the Canadian International Paper Company, Ltd. The plant will take care of the growing Canadian demand, and will take advantage of certain export markets.

A new "Presdwood" board is to be placed on the market which will appeal strongly to industrial users. This is one of the new products developed through the corporation's long-term program of research in the field of chemicals and plastics. More than 50 per cent of the products are now used in industry, and the other 50 per cent in building.

The board voted the regular quarterly dividend of $1.25 on preferred stock, payable on December 1 to stockholders on record as of November 15. A dividend of 25 cents for the quarter also was voted on the common stock, payable December 9 on stock on record as of November 15.

Fox River Safety Meeting Slated for May 1940

May 23 is the date set for the 1940 Fox River Valley and Lake Shore safety conference at Marinette, Wis. A meeting was held there last week to make the preliminary plans. William Kuh was appointed general chairman, A. C. Boyd, executive secretary, and Henry Anderson, treasurer. Among others assisting will be Rudolph W. Meyer, Badger Paper Mills, Inc., and T. L. Christensen, Southern Kraft Corporation.

Chicago Paper Market Situation Excellent

Midwest Trade Reports Business Almost Normal With Demand Steady At High Level—Federal Reserve Reports Paper Sales Up 20.5 Per Cent —Midwest SAPI Adds New Members — Butler Co. Erects Warehouse.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., October 30, 1939—A most satisfactory situation prevails in the Chicago paper market according to local observers who believe that the market has returned almost to normalcy and without any lessening of the strong basis now being enjoyed. Within the past two weeks, in particular, mills are reported to have reached and maintained about capacity production as an indication that something resembling a status quo has replaced the less predictable situation of a month ago.

The book paper market is reported as in excellent shape with buying steady and with no evident inclination on the part of buyers to seek lower price levels. Covers are likewise steady to strong, reflecting the current strength in the general business picture.

Sulphites are reported as having no difficulty in maintaining the upward swing in the price structure and all grades are enjoying a good volume. Krafts, in an undoubtedly strong position, reported less hysteria and an indication of a normal definite improvement in business itself. Bonds and ledgers were likewise firm as were newsprint and groundwood markets.

Reserve Reports Paper Sales Up 20.5 Per Cent

Further expansion took place during September in wholesale trade in paper and allied lines in the seventh federal reserve district. Net sales for September of this year showed a 20.5 per cent increase as compared to the same month in 1938 while stocks on hand were up 15.8 per cent. Accounts outstanding showed a 15.6 per cent increase while collections were 15.3 per cent ahead of a year ago. As compared with a year ago, wholesale distribution of commodities in the district totaled 17 per cent more in the current period.

The quickening pace in the seventh district during September was reflected in an unusually sharp upturn in new business booked by district paper mills which are located in the States of Wisconsin, Michigan, Iowa, Illinois and Indiana.

The following summary indicates a moderate increase in shipments with only a very slight decline in tonnage production of both paper and pulp.

	September, 1939 Per cent Change from	
Paper	August, 1939	September, 1938
Orders booked (tons)	up 53.2	up 57.5
Orders booked (dollars)	up 55.7	up 59.7
Shipments (tons)	up 5.6	up 20.5
Shipments (dollars)	up 5.4	up 17.9
Production (tons)	minus 2.8	up 15.9
Stocks at end of month (tons)	up 0.9	minus 2.7
Pulp		
Production (tons)	minus 1.9	up 9.3
Stock at end of month (tons)	minus 5.6	minus 14.9

The 730 reporting firms in the paper and printing industry in the district showed interesting conclusions for the week of September 15 as compared to August 15. The companies reported 76,273 wage earners with earnings of $2,217,000 representing a decline of 5 per cent in wage earners and an increase of 1.5 per cent.

Midwest Salesmen Add New Members

Headquarters of the Salesmens Association of the Paper Industry, midwest division, reveal the fact that two additional concerns have taken membership in the many worthwhile activities of that organization. The two are the Union Bag and Paper Corporation of Chicago and Blandin Paper Company of Grand Rapids, Minn., B. A. Weathers, Jr., will represent Union Bag while A. V. Trumbo is the sales executive listed to represent the Minnesota company.

Butler Co. Building New Warehouse

Through the Butler Paper Company headquarters here comes the news that a new modern warehouse and office building is being completed for the St. Louis subsidiary, the new structure to represent 40,000 square feet of floor space and to be located at 3400 Market Boulevard. Recently the Mississippi Valley Paper Company of St. Louis officially changed its name to the Butler Paper Company and it is as the Butler Paper Company that the new St. Louis organization will be known.

Paper Container Discussion Continues

The subject of milk containers made from paper continues to be of major importance to Chicago's metropolitan newspapers. This week Board of Health president Herman Bundesen, told the city council why he favored milk containers made of paper. He indicated that inasmuch as the board of health had recommended that the city ordinance be amended to permit sale of milk in paper containers he naturally "followed the will of the Board." While Dr. Bundesen was testifying local dairy companies announced that if the city council ultimately approved the Board's resolution, they would test the acceptability of two quart paper milk containers which have proven successful in consumer tests in New York State. Officials of the Borden-Wieland Company said they had watched the development of the two quart container with much interest, finding that distribution of milk in the single quart paper container is more expense than distribution in the glass quart bottle but that the economies really commence to be noted in using the two quart container.

Big Pulp Order for Rayonier

Japanese customers have placed orders for 21,500 tons of dissolving pulps with Rayonier, Inc., it was announced by J. D. Zellerbach, executive vice president. The orders call for completion of shipments by the end of next February. War conditions, affecting exports of dissolving pulps from Scandinavian countries, are believed to have some bearing on the Japanese orders, which are the first received by Rayonier since last June.

Canadian Reported Newsprint Leveling Off

United States Consumers Reported Ordering Less Newsprint and This Decline May Show In November Shipments But Tonnage Is Now High — Exports Reflect Unusual Demand—Pulp Exports Lower—Other News.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., November 1, 1939—It is reported here that there has recently been observable a definite leveling off in the demand for Canadian newsprint on the part of United States consumers, and that this may be reflected in the November shipments, although these will undoubtedly be maintained at a relatively high level. Discussing this situation, the Montreal Gazette says: "The tapering off in buying, it appears, is due to a combination of factors. The most important, perhaps, is the disappearance of the extreme uncertainty as to future supplies of newsprint that came with the outbreak of hostilities—the chief uncertainty now, it might be said, seems to be about the duration of the war, whether it will last for more than a few months. The action of the leading mills in extending the $50 price for the first quarter of 1940 has also been a factor in reassuring consumers. Moreover, reports from the United States suggest that resumption of imports from Scandinavia in fair volume may be looked for in the near future. Altogether, it is said, the period of excited forward buying appears to be ending."

Exports of Wood Pulp Decline

Exports of wood pulp for September amounted to 986,789 cwt., valued at $2,220,372, as compared with 1,461,357 cwt., valued at $2,937,169 in August and 1,116,340 cwt., valued at $2,304,564 in September, 1938. For the nine months to the end of September shipments of pulp amounted to 9,016,766 cwt., valued at $20,371,748, as compared with 8,007,070 cwt., valued at $20,399,961 in the similar period of last year.

Rolland Paper Co. Expands

The Rolland Paper Company, Limited, manufacturers of high grade paper at St. Jerome, Que., have started construction on a plant addition which will increase the company's productive capacity by 25%. The new facilities will be in operation by April next. The Dominion Engineering Company, Ltd., Montreal, has the order for the new paper making machinery.

Export Figures Reflect Unusual Demand

Detailed figures in regard to September shipments, just released by the Dominion Bureau of Statistics, reflect a sharp increase in the quantity and value of newsprint exports for that month, as compared with those of September, 1938, but a moderate recession from the exports in August. The amount exported totalled 4,563,255 cwt., valued at $9,872,464, as compared with 4,709,735 cwt., valued at $10,194,899 in August and 3,911,722 cwt., valued at $8,523,555, in September, 1938. For the nine months to the end of September shipments amounted to 37,578,837 cwt., valued at $81,180,060, as compared with 34,386,449, valued at $73,892,415, for the similar period of last year. Of the total exports in September the United States took 3,734,468 cwt., valued at $8,278,086; the United Kingdom 344,332 cwt., valued at $550,935; Argentina 134,221 cwt., valued at $262,768; New Zealand 113,077 cwt., valued at $247,221; British South Africa 88,983 cwt., valued at $196,474; Australia 53,635 cwt., valued at $126,820; and British India 24,069 cwt., valued at $57,755. The remainder went to 25 different countries.

E. A. Worm Goes To Pensacola

E. A. Worm, Jr., assistant general superintendent of the Arrowhead, New York plant of the Armstrong Cork Company, has been appointed general superintendent of the company's Pensacola, Florida plant which manufactures Temlok fibre board insulation products, according to an announcement from Armstrong's headquarters at Lancaster, Pa. Mr. Worm succeeds A. W. Baldwin who is continuing in the capacity of consulting engineer. Mr. Worm joined Armstrong in 1930. He graduated from Syracuse University where he took the degree of Bachelor of Science in Pulp and Paper, and was previously employed by the International Paper Company. After spending a year in Armstrong's Central Technical Laboratory as a chemist, he was appointed assistant general superintendent at the Arrowhead plant.

The vacancy created by Mr. Worm's appointment, will be filled by H. R. Huffman, now plant and industrial engineer at Arrowhead. Mr. Huffman joined Armstrong in 1934 as an industrial engineer following his graduation from Pennsylvania State College.

Bogus Club To Meet Dec. 8

Great activity is taking place among the various committees of the Bogus Club in preparation for their annual dinner to be held on December 8.

This well-known organization, started by the salesmen identified with Charles F. Hubbs & Co. for mutual benefit and good fellowship, meets at luncheon twice a month and has given a dinner each year, this being the fifth to be held.

These dinners have become very popular and are an annual fall event in the paper industry throughout the metropolitan area.

The guest of honor this year will be Lowell J. Whiteford who has been associated with Charles F. Hubbs & Co. since October 1, 1909 and is now the Treasurer of that company.

The present president of the Bogus Club is Leslie B. Carpenter and his successor will be announced at this annual dinner which will be held at the Downtown Athletic Club, 18 West Street, New York City, on December 8th at 7 P.M. Reception to guests, etc. will be from 6 to 7 P.M.

Financial News of Pulp and Paper Industry

Increased Profits Reported By Union Bag, Johns - Manville, Ruberoid, Flintkote, Oxford Paper and Philip Carey — Various Canadian Mills Show Higher Earnings—Net Loss For Robert Gair Co. and Subsidiaries.

New York Stock Exchange

High, Low and Last for the Week Ending November 1, 1939

	High	Low	Last
Armstrong Cork Co.	41	39	39
Celotex Corp.	11¾	10⅜	10⅜
Celotex Corp., pf.	62	61½	61½
Certain-Teed Products Corp.	8⅛	7¼	7¼
Certain-Teed Products Corp., pf.	39	34⅞	35
Champion Paper & Fibre Co.	28¼	26½	26½
Champion Paper & Fibre Co., pf.	101	101	101
Congoleum-Nairn Co.	26⅛	25	25
Container Corp. of America	16¾	15½	16⅜
Continental-Diamond Fibre Co.	8⅜	7⅝	7⅝
Crown-Zellerbach Co.	16⅜	15	15⅜
Crown-Zellerbach Co., pf.	88½	88	88¼
Flintkote Co.	23⅛	20⅜	21¼
Robert Gair	5⅜	4¾	4⅞
Robert Gair, pf.	18⅜	16⅛	16¼
International Paper & Power	14½	13¼	13⅜
International Paper & Power, pf.	52⅜	49	50
Johns-Manville Corp.	81⅞	77½	77½
Johns-Manville Corp., pf.	126	125	125
Kimberly Clark Corp.	35	35	35
MacAndrews & Forbes	31	30½	31
Masonite Corp.	42	38¼	38⅞
Mead Corp.	13½	12	12¼
Mead Corp., pf.	72	72	72
Paraffine Companies, Inc.	46⅜	44¾	44¾
Rayonier, Inc.	17⅞	16¾	16¾
Rayonier, Inc., pf.	26⅞	25⅞	25⅞
Ruberoid Co.	22¼	20⅜	20¾
Scott Paper Co.	50¾	50	50¾
Scott Paper Co., pf.	115½	113⅞	115½
Sutherland Paper Co.	28¾	27¾	27¾
Union Bag & Paper Corp.	12½	11½	11½
United Paperboard Co.	6⅞	6½	6⅝
U. S. Gypsum Co.	84½	79	79
U. S. Gypsum Co., pf.	167	165	167

New York Curb Exchange

High, Low and Last for the Week Ending November 1, 1939

	High	Low	Last
American Box Board Co.	8	7⅝	8
Brown Co., pf.	24¾	23½	23½
Great Northern Paper	42	42	42
St. Regis Paper Co.	3¾	3⅜	3⅜
St. Regis Paper Co., pf.	57	56	56
Taggart Corp.	4⅞	4½	4⅝

Union Bag Nets $207,686

Union Bag & Paper Corporation in the third quarter this year earned net income of $207,686 after all charges including provision for Federal income and capital stock taxes, to nearly equal total net profit for the first six months of 1939, according to an interim statement being mailed to stockholders by Alexander Caldar, president.

This was equal to 16 cents per share of the capital stock outstanding and compared with a net profit of $203,667 for the quarter ended September 30, 1938, also equal to approximately 16 cents per share of capital stock now outstanding. In the second quarter ended June 30, this year, the company reported a net of $78,875, equal to six cents a share on the same number of shares.

Sales in the third quarter, this year, advanced sharply to $5,009,999 from $3,673,872 in the second quarter ended June 30, 1939, and $3,805,052 in the first quarter ended March 31, 1939.

"The increase in sales volume shown for the quarter ended September 30, 1939, brought the net profit up to a figure approaching the total net profit for the first six months of the year, in spite of the fact that price levels on grocers bags, our principal product, were lower than at any time since 1933 and prices on our other paper products were also at very low levels," Mr. Calder said. "Since the close of the last quarter, prices have advanced sharply and new orders are now being placed at the more reasonable 1937 levels."

For the 12 months ended September 30, this year, net profit was $579,439, equal to 46 cents per share of capital stock outstanding. This compared with a net profit of $1,109,974, or 88 cents per share of capital stock now outstanding, for the 12 months ended September 30, 1938. For the 12 months ended June 30, 1939, net profit was $575,020, equal to 46 cents per share on the same number of shares.

Sales for the 12 months ended September 30, 1939, totaled $16,887,751 to compare with sales of $16,-023,068 for the 12-month period ended June 30, 1939, and with sales of $15,910,104 for the 12 months ended September 30, a year ago.

Johns-Manville Profits Rise

Consolidated net earnings of $1,472,255 for the September quarter are reported by the Johns-Manville Corporation and its subsidiary companies. The financial statement by Lewis H. Brown, president, is issued for publication today.

The earnings are equal to $1.58 each on the 850,000 shares of common stock outstanding and compare with consolidated net earnings of $882,366 in the third quarter of 1938, equivalent to 89 cents a share on the common stock, after dividend requirements on the preferred.

Sales for this year's September quarter increased $2,345,796, or 19 per cent, to a total of $14,687,253 from sales of $12,341,457 in the corresponding 1938 quarter.

Operations for the first nine months of 1939 resulted in consolidated net earnings of $2,675,999, or $2.69 a share on the common stock, after provision for preferred dividends. Consolidated net earnings in the comparable period a year ago were $857,469, or 55 cents a share on the common stock, after preferred dividend requirements.

Nine months' sales, this year, aggregated $38,789,-322, an increase of $4,087,033, or 12 per cent, over the $34,702,289 corespondingly last year.

Profits of Canadian Mills Higher

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., November 1, 1939—Various pulp and paper companies are reporting a betterment in earnings during the past few months. The Fraser Companies at Edmundston, N. B., report that for the three months ending September 30 there has been a substantial improvement in business. Consolidated net profit for the quarter amounted to $3,809, as compared with a net loss in the preceding quarter of $184,856 and a net loss in the third quarter of last year of $189,269. It is also estimated that the operating profits of the Donnacona Paper Company

this year will run to around $800,000, as against $501,700 in 1938 and $600,275 in 1937. The Bathurst and Brompton companies, as well as the Wayagamack division of Consolidated Paper, are also benefitting from the better market for their products, and improved price levels for such products as board and kraft.

Ruberoid Nets $501,875

Ruberoid Company for the nine months to Sept. 30 reports a consolidated net profit of $501,878, equal to $1.26 each on 397,806 outstanding shares, Herbert Abraham, president, announced yesterday. This compares with $351,052 or 88 cents a share earned last year. September quarter: Net profit, $239,871 or 74 cents a share. Net trading profit for the third quarter of last year was $187,682, exclusive of a non-recurring item of $158,091 representing a final liquidating dividend received from the Ruberoid Purchase Corporation, dissolved on Sept. 23, 1838. Net sales for the nine-month period increased 18 per cent to $12,017,864 from $10,159,511 last year and net sales for the third quarter of $4,778,221 increased 25 per cent over net sales of $3,814,038 in the same quarter a year ago.

Flintkote Earnings Higher

Flintkote Company and subsidiaries for forty weeks to Oct. 7 reports a net income of $1,143,106, equal to $1.70 each on 672,996 shares outstanding, against $706,613 or $1.05 each on 670,346 shares outstanding at the end of the corresponding period a year ago; net sales totaled $13,225,854 against $11,689,700. Twelve weeks to Oct. 7; Net income, $532,775, or 79 cents a share, against $436,987 or 65 cents a share in similar weeks of 1938; net sales totaled $4,886,025 against $4,390,342. Fifty-two weeks to Oct. 7; Net income, $1,248,310, or $1.85 a share, compared with $620,046, or 92 cents a share in corresponding period a year ago; net sales increased to $16,683,862 from $14,435,402.

Robert Gair Reports $96,079 Loss

Robert Gair Company, Inc., and subsidiaries report for the September quarter a net loss of $96,079, after interest on subsidiary bonds, interest on income notes, subsidiary preferred dividends, loss on sale of inventory of discounted operations and $119,953 loss on disposal of capital assets and readjustment of investment in former affiliated company. Net loss in preceding quarter was $147,523 after $153,483 deduction for loss on disposal of capital assets, and in the September quarter of 1938 the net loss amounted to $37,946. Nine months to Sept. 30: Net loss, $279,388, including $273,234 loss on disposal of capital assets, compared with net loss of $73,635 last year.

Oxford Nets $383,919

Oxford Paper Company and subsidiaries for the nine months to Sept. 30 report a net profit of $383,919, compared with $71,226 last year. September quarter: Net profit, $156,371, equal to 7 cents each on 381,139 common shares, compared with $27,586 last year.

Celebrate Gair Centenary

The centenary of the birth of Robert Gair, August 31, 1839, was celebrated at the Seventh Annual Banquet of Gair Old Timers Association on the evening of October 21, 1939, in the Grand Ballroom of the Hotel New Yorker, New York City.

This association was founded in memory of Robert Gair by those who had at one time or another worked for Mr. Gair or his company, the Robert Gair Company, Inc., for a period of ten years or more. Each year the attendance at the annual dinner has been over one hundred, and this year the number was 125. The officers for 1939 were: Honorary Chairman, George W. Gair, Chairman of the Board, Robert Gair Company, Inc.; Honorary President, William Brennan, retired, whose employment began in 1883 and continued throughout his business career; President, George W. Shannon, Robert Gair Company, Inc.; Vice-President, Felix F. Doll, William W. Fitzhugh, Inc.; and Secretary-Treasurer, H. B. Van Antwerp, of Sinclair & Valentine Co., New York City.

George W. Gair related many interesting bits of Robert Gair's (his father's) life and incidents in the early history of the Company, which is seventy-five years old this year. Short addresses were made by William Brennan and Lawrence Beattie, Treasurer of Gair Realty Corporation. George W. Shannon acted as toastmaster and chairman of the meeting.

Officers for 1940 were elected at the dinner as follows: Honorary Chairman, George W. Gair; Honorary President, E. B. Kelley, President of E. B. Kelley Company, Inc., whose employment began about 1889; President, Harry J. McPhilliamy, Sales Manager, Shipping Container Divisions, Robert Gair Company, Inc.; Vice-President, Louis Barbieri, of Sterling Engraving Company; H. B. Van Antwerp, of Sinclair & Valentine Company, New York City, was re-elected Secretary-Treasurer.

Buys Paper Under Walsh-Healey Act

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 1, 1939—During the week ended October 14, the Government purchased $236,633.39 worth of paper and allied products under the Walsh-Healey Act as follows: Resolute Paper Products Corporation, N. Y. C., $29,375.00 worth of toilet paper for the Procurement Division; West Disinfecting Company, Long Island City, N. Y., $27,750.00 worth of paper towels for Procurement Division; Joseph M. Price t/a Improved Mailing Case Company, N. Y. C., $30,869.70 worth of fiber containers for War Ordnance; and the Canister Company, Phillipsburg, N. J., $148,638.69 worth of fiber containers for War Ordnance.

Philip Carey Earns $248,412

Philip Carey Manufacturing Company reports a net profit of $248,412 for the quarter ended on Sept. 30, after all charges, compared with $119,803 for the same period of 1938. Net profit for the twelve months ended on Sept. 30 aggregated $304,420, against net loss of $265,966 for the corresponding period of last year.

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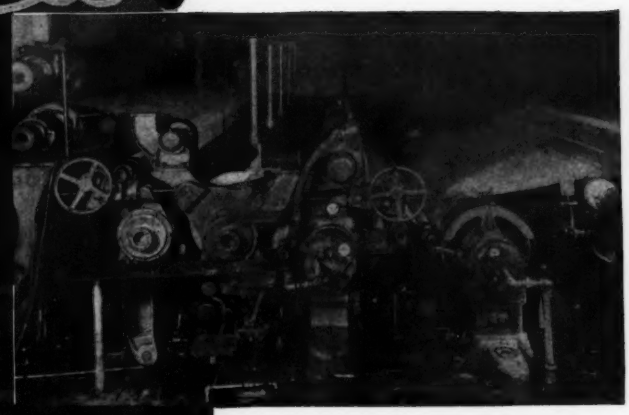

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BELOIT IRON WORKS BELOIT WISCONSIN

How To Win The War On Dirt*

By F. K. Becker[1]

I don't believe there is anyone in this group here who will disagree with the statement that we in the paper industry have to fight a continuous and never ending battle to protect our paper from the invasion of that arch enemy of all papermakers—dirt.

My purpose is to contribute information on the newest methods and equipment now being employed to vanquish this common enemy, and, fortunately, no censorship is yet imposed on *this* kind of news.

Right here is a good opportunity to pay tribute to one characteristic of our industry in which it excels most others, and this is based not only on my own observation but on what others who contact many industries have told me. I am speaking of the willingness, I'll go further than that and say, the eagerness of you men to exchange information on new and successful strategies and applications of equipment to meet and beat a common enemy, such as dirt. To my mind this spirit of mutual helpfulness is one of the major factors in the growth and stability of our industry.

Now, to get on with my job of discussing the best and most modern ways of getting dirt out of paper stock, I needn't waste your time elaborating on the importance of making the production of this year's and next year's paper come clean. You don't need me to tell you that your customers do not like dirty paper, and that their idea of *clean* is a lot more finicky than it used to be. That's simply a matter of evolution—of progress. What the customer would have cheerfully accepted as clean paper ten, even five, years ago he now scorns and rejects. I am reminded of the series of tests reported at a TAPPI meeting recently which demonstrated that a group of mills making identical grades were now making their paper three times as clean as they did eight years ago. Not only was the average dirt count 66 per cent less but the size of dirt specks 50 per cent smaller than they used to be.

I think I can say without fear of contradiction that the standards of paper cleanness are higher now than they have ever been and this applies not only to fine writings but to all grades right down the line. But I am also happy to say that the means for attaining these standards are also at hand. I shall be able to show you, briefly, that there are better and more varied weapons of defense against every form and variety of dirt than were available when standards were less exacting.

Means of Separating Dirt from Stock

In general, there are but two basic means of separating dirt from paper stock. One takes into account the difference in size of the dirt and the fibers, and effects the separation by employing screens of various types. The other makes use of the differences in weight or specific gravity between the fibers and the dirt. Originally rifflers and sometimes magnetic separators were employed for this purpose, more recently centrifugal or centrifining equipment, and still more recently pressure differential devices which ingeniously magnify these weight differences in order to render a rapid and thorough separation.

In tackling any individual mill problem of dirt separation the first practical step is, of course, to examine, analyze and classify the character and relative amounts of the various kinds of dirt found in the finished product. Without such a preliminary scouting it would be unwise indeed to proceed with the major attack on dirt employing one or more of the various weapons available in the form of dirt removal equipment. Assuming then that this advance study of the dirt situation shall have been made we may proceed to a consideration of modern dirt removal tactics.

Screening

From the standpoint of both results and number of mills affected, by all odds the most important development in the war on dirt has been the shift to finer cut screen plates made practicable and economical by modern paper screen design and engineering. This has provided the added capacity to permit gentle, efficient screening action. It is by now well understood that forcing the stock through screens of inadequate capacity, however fine cut the screen slots, defeats the very purpose of the finer slots since much of the dirt may be forced through along with the stock.

This was proved in a very interesting way by a sulphite specialty mill that had already adopted screen plates as fine as practicable for their stock. They made tests with varying amounts of stock flowing through the screens and obtained proportional reductions in dirt count as the amount of stock put through was reduced.

Recently we made a survey of all the Bird Screen installations that had been put in over a relatively short period, not on new or enlarged machines but to replace existing screening equipment. This study took in some thirty mills of all sizes and making all grades. It proved far more conclusively than any general statement I could make that a good many papermakers are on the job to increase cleanness and quality through better screening. The average size of screen slots for all these screen replacements showed a reduction of 20 per cent while at the same time the combined effective screening area increased no less than 62 per cent.

Slot Width of Screens

Specifically the bulk of these up-to-date screen replacements are equipped with plates having 0.012-in. slots or finer. The most popular size seems to be 0.010-in. although a number of mills are using slots as fine as 0.008 in. and even .007 in. with complete success. In one tissue mill they are running at 450 feet a minute with 0.008-in. cut plates, getting better than 33 per cent reduction in dirt count as well as much improved formation, since the finer slots better individualize the fibers. It must not be forgotten that the screens perform a very valuable function in addition to the removal of dirt differing in size from that of the paper fibers. They comb out the fibers, de-

* Presented at the Joint Meeting of the New England Section of the Technical Association of the Pulp and Paper Industry and the Superintendents Association, Pittsfield, Mass., Sept. 30, 1939.

[1] Vice President, Bird Machine Co., S. Walpole, Mass.

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livering to the paper machine a homogeneous mixture of stock and water that is uniform in weight and free from lumps, strings and slime. This is practically essential for the production of well formed paper at today's operating speeds.

The difference in cleanness resulting from these changes in screen slot size and screening capacity makes all the difference in the world in many a mill's ability to maintain or strengthen their relative quality position in their grade. Reductions in dirt count of 50 per cent or more are not at all unusual. One sulphite bond mill replaced two no. 2 Bird screens using 0.016-in. plates with two big 3A screens equipped with 0.010-in. plates. Dirt count was immediately cut in half. A book paper mill changed from screens with 0.014-in. cut plates to larger screens with 0.010-in. plates and reported an instant reduction in surface specks to less than half the number formerly counted. One mill manager who recently added sufficient screening capacity to permit efficient use of 0.008-in. plates tells me that he is now submitting samples to customers he had previously lost due to inability to satisfy their quality requirements. His sheet is now so much cleaner that he is confident of winning back these old customers as well as getting new ones.

I have dwelt on this first point of attack for practically all dirt removal campaigns because experience shows that it cannot be dispensed with or displaced by the other methods I am going to discuss, and while many of you are already making full use of the advantages of modern screening practice there are still some who take screens for granted and have yet to realize on the possibilities for increased dirt removal that are being demonstrated by those employing the right combination of fine cut plates and screening capacity. However, I know you want to be informed on all available means of defense against dirt so I shall pass on from the one method of separation according to differences in *size* between the stock and the dirt particles to the other method of separation which takes advantage of the differences in *weight* of the fibers and the foreign matter.

Separation by Centrifugal Force

As you know, it is possible to magnify even slight differences in specific gravity of the fiber and the dirt by the employment of centrifugal force through the process known as centrifining. The modern application of this principle puts the stock through not one but three separate treatments employing three different degrees of centrifugal force. How this action takes place is clearly shown in Fig. 1.

This triple treatment centrifining is achieving results with certain stubborn forms of dirt, such as rubber, that had previously defied attempts at removal. Because of its uniformly high efficiency of dirt removal—85 to 90 per cent in most instances—the centrifiner has a definite and powerful strategic position in the war on dirt. A 50 per cent rag ledger that showed a dirt count of 60 specks showed only 7.4 dirt count after centrifining was applied. In another case the percentage of no. 1 sheets was stepped up from 55 to 97 per cent. The advantages of such super efficient dirt removal show up in many ways. The reduction in seconds and throw outs is often the equivalent of a big increase in production per machine per day. Some mills say it is possible to make a substantial reduction in furnish because of the high output of no. 1 paper. Others cut sorting time and expense, both on raw materials and finished paper. And so it goes.

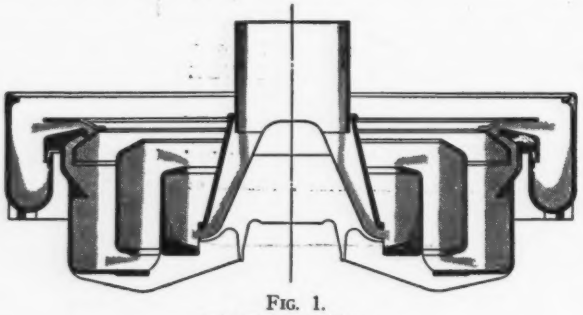

FIG. 1.
The Bird Centrifiner

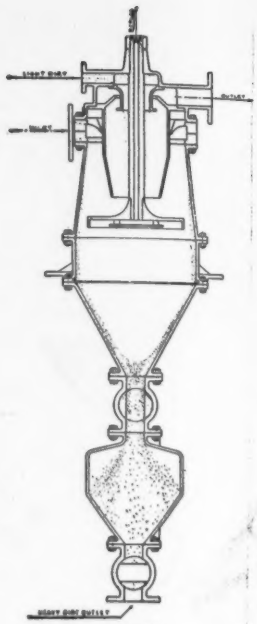

FIG. 2.
The Bird Purifiner

Still another ingenious and formidable method of attack on dirt that is heavier or lighter than the paper fiber is to employ pressure and gravity, using sharp differences in the pressure of the paper stock itself to magnify the weight differential between dirt and stock and so effect a separation.

This method which we call pressure-purifining is attracting a great deal of attention and interest because it is relatively new to this country although it has been widely and successfully employed on the Continent for a number of years.

Now let us look together at the purifiner section Fig. 2 and see how it operates. The stock is pumped to the inlet so that it enters at high speed and is delivered through a circular pipe at a tangent to the interior wall of the stationary container. It is interesting to note that the purifiner employs no moving parts. The rotating motion of the liquid plus a sharp drop in pressure serve to yank the heavier-than-fiber dirt away from the stock, keeping it against the wall from which it descends by gravity. The lighter-than-fiber impurities assemble at the center of the rotating flow of clean stock and are drawn off through their own special exit as shown on the diagram.

One sulphite specialty mill equipped with purifiners has been kind enough to supply us with figures on comparative dirt counts made before and after the purifiner installation on identical grades. The reduction ranges from 30 to 86 per cent, depending of course on the relative amounts of dirt present in the given grade. For example, a drawing paper having a dirt count of only 8 before purifining showed a dirt count of 4 afterward, a 50 per cent drop, whereas a bond paper containing 33 specks showed 10 after purifining, a 70 per cent reduction; and an envelope paper that formerly had 22 specks dropped to 3, or

86 per cent. What the mill considers of equal quality significance is the fact that the specks were much larger before purifining, those counted after purifining being so fine that they called for a magnifying glass.

As soon as the purifiners started operating in this mill comments were received from the finishing room on the sharp reduction in the number of throwouts.

Conclusion

Here then are three powerful and trustworthy weapons of defense against dirt, the eternal enemy of paper quality and production economy. Naturally the successful strategy for any given case cannot be worked out without a knowledge of the individual factors. I would be the last person to tell you offhand that you need this, that or the other, or perhaps all three. That is a matter of individual planning and strategy. What I have tried to do is to give you a picture of the possibilities now available so that you may overlook no opportunity to win a lasting and profitable victory over dirt.

In speaking to me about presenting this paper one of our good friends put it this way. He said: "The time will never come when mills are no longer interested in taking out all the dirt that can be removed from paper."

I will say in turn that the time will never come when we who build your machinery will no longer be interested in developing ways and means of getting out more and more dirt and helping you to make cleaner and cleaner paper, paper that's easier to sell and that makes you more money. If I have been able to bring you some bit of information that may help you win your particular war on dirt I shall be more than pleased. You can count on us to keep on trying to design and build tighter and stronger defenses all along the line.

David J. McGreen Goes With Atlantic

David J. McGreen has recently been appointed a New York sales representative of the Atlantic Gummed Paper Corporation, Brooklyn, N. Y., according to an announcement by Fred A. Stocker,

DAVID J. MCGREEN

president. Mr. McGreen has had wide experience in the gummed paper industry, both manufacturing and sales, and for the past eleven and one-half years was associated with Nashua Gummed and Coated Paper Company.

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Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 1, 1939—Barton, Duer & Koch Paper Company has been awarded the contract for furnishing the Government Printing Office with 21,375 pounds (150,000 sheets) of 28 x 34, 50 per cent rag, white ledger paper at 10.65 cents. Marquette Paper Company will furnish 102,350 pounds (800,000 sheets) of 32 x 42 and 28 x 34 white sulphite bond paper at 5.67 cents. Bids for these items were received on October 11.

Stanford Paper Company will furnish 21,000 pounds (750,000 sheets) of 50 per cent rag, 10½ x 16 white M. F. printing paper at 10.32 cents. Marquette Paper Company will furnish 5,000 pounds (96,000 sheets) of 22 x 34 blue sulphite writing paper at 6.98 cents. Mudge Paper Company will furnish 2,000 sheets of 24 x 36 Quaker drab cloth lined cover paper at $148.28 per M sheets. Old Dominion Paper Company will furnish 100,000 sheets of 22 x 34 white gummed paper at $9.644 per M sheets. Bids for all of these items were received on October 6.

Whitaker Paper Company will furnish 5,000 sheets of 24 x 36 brown cloth lined cover paper at $115.89 per M sheets. Paper Corporation of the U. S. will furnish 40,000 pounds of newsprint paper in 36" rolls at 3 cents. Bids for these items were received on October 2.

The Printing Office received the following bids for 399,925 pounds (1,882,000 sheets) of 25 per cent rag, 39 x 51 white bond paper; Aetna Paper Company, 9.63 cents; Butler Company, 11.47 cents; R. P. Andrews Paper Company, 8.49 cents; Stanford Paper Company, 9.1 cents; Whitaker Paper Company, 9.16 cents; Paper Corporation of U. S., 11.73 cents; Old Dominion Paper Company, 200,000 pounds at 7.979 cents and balance at 8.478 cents; Walker, Goulard Plehn Company, 9.25 cents less 1 per cent; and Mudge Paper Company, 9.07 cents.

For 72,000 pounds (1,000,000 sheets) of 21 x 32 white sulphite bond paper; Barton, Duer & Koch Paper Company, 6.06 cents; Mudge Company, 6.4 cents; Stanford Paper Company, 6.25 cents; Marquette Paper Company, 5.645 cents; Aetna Paper Company, 6.2 cents; Old Dominion Paper Company, 5.993 cents; Walker, Goulard Plehn Company, 5.81 cents; and R. P. Andrews Paper Company, 5.96 cents.

Indianapolis Reports Good Volume

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., October 30, 1939—From all local reports, October has been a good month in the paper business in central Indiana. Volume in all lines, particularly in the fine paper field, has been very good, an increase over September. Prices have been slightly stronger in sulphites, bonds and other items in the fine paper field and from all indications the demand will carry over into the next month. According to some jobbers they have had reports from mill representatives that a slight lull in operations is being forecast. The local trade hopes this will not be permanent. It also is hoped locally that prices will not go to too strong a level, since a break in the market will react almost immediately on the local trade.

Newsprint demand has shown little change in the last week or so. It is reported that lineage is about normal for this season of the year and little change is expected until after Thanksgiving, when a spurt is generally in order. Indiana publishers are beginning to think of new contracts after the first of the year. The small town papers, following the harvest season, have gone back to their usual lineage.

Building paper and roofing demand has slumped somewhat during the last two weeks, but the volume continues to hold much better than the same time a year ago. The year as a whole will finish next to 1929 locally and perhaps the same situation will be true for the entire state. Dealers have begun thinking of the close of the season and inventory and are confining their orders to material that can be turned over immediately.

The first hint of really cold weather last week caused a big slump in container demand from the ice cream trade. Dozens of ice cream parlors opened each summer closed their doors until next spring. A slump in demand for corrugated paper cases used by breweries also was noted. The remainder of the container field was reported in good shape.

Many grades of waste paper were in good demand last week with prices firm and particularly good on the better grades.

Chemipulp Mill Operation

A 190-page handbook under the title of "Chemipulp Sulphite Mill Operation" has just been published by Chemipulp Process Inc., Watertown, N. Y. This is not a technical treatise on the sulphite process but rather a practical description of the subject covering operating problems. Compiled from data over many years and covering a large number of mills, this volume provides a concise explanation of the various phases of the sulphite process in its application to actual operating problems.

The practical nature of the book is indicated in its contents page. Following a historical outline of the sulphite process, is a concise and readable description of all the steps in this process, with chapters in the chemipulp hot acid cooking and recovery system, which includes equipment, normal operation, alternative method of hookup and operation, removal of CO_2 and other gases from the digester relief, etc. Tables include definition of chemical analysis of wood, constituents, specific gravity and weights of wood, pulp yield tables, etc. In other words, this volume is an excellent description of this particular process, clear and readable, and provides a full outline of the subject without confusing technical terms or material.

Bates Valve Bag Co. Ltd. Registers

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., October 14, 1939—After engaging in business in Vancouver for approximately two years, the Bates Valve Bag Company Ltd., has now been registered as an Extra-Provincial Company and will continue to engage in the production of its various types of patented valve bags. British Columbia offices are located at its own plant, 146 Second avenue West, Vancouver, while head offices of the company are at 936 Canada Cement Building, Cathcart street, Montreal. The firm has paid-up capitalization of $250,000.

Obituary

Earle V. Rodgers

Earle V. Rodgers, president of the Papyrus Company, Kenilworth, N. J., manufacturers of crepe paper, died suddenly at his home at Cranford, N. J., October 19, in his 52nd year.

Mr. Rodgers was president of the Papyrus Company since its organization in 1909. He attended Princeton University, class of 1910, and was a member of Elm Club. In college he was active in track and swimming.

Surviving are his widow, Ruth G., two sons, John G. and William G., and two daughters, Patricia E. and Mrs. Morton C. Fitch, all of Cranford, N. J.

Allan W. MacBeth

Allan W. Macbeth, comptroller of the Mead Corporation, died at the wheel of his auto at noon, October 18th, in Chillicothe, Ohio, while on the way from his office to his home.

H. L. Wolf, Mead personnel man, witnessing the seizure, rushed into the street, boarded the car and brought it to a stop as it struck the curb.

Mr. Macbeth was well known in financial circles and throughout the paper industry. He was highly regarded for his sterling character and courteous relations with his associates. Treated for heart trouble for about a year he is survived by his widow, three children and a brother, also with the Mead Corporation.

William B. Reddick

[FROM OUR REGULAR CORRESPONDENT]

WATERTOWN, N. Y., Oct. 28, 1939—William B. Reddick, for many years superintendent of the old Continental Paper & Bag Company, died at his home this week following a long illness. He was born at Valatie, N. Y., in 1866. He had worked in various paper mills in the state before coming to this city. He came to this place about fifty years ago and for several years he was identified with the Remington Paper Co. Later he was made superintendent of the mill of the Continental Paper Co., manufacturers of tissue paper products, which position he held until operations were suspended. He retired following the closing of the mill. His widow and several nieces and nephews are the survivors.

David J. Lawless

David J. Lawless, 72, who had been associated with the Onondaga Paper Company, Marcellus Falls, N. Y., for many years as general manager, died October 26. Funeral services were held on October 30 and interment was in Marcellus Falls, N. Y.

Benjamin G. Loomis

GOUVERNEUR, N. Y., Oct. 28, 1939—Benjamin G. Loomis, a director and assistant secretary of the Loomis Talc Corporation, died this week following an extended illness. He was 73 years old. He had been a resident of this village since 1932 when he moved here from Watertown. He was prominently connected with financial institutions in this section for many years. The principal survivors are a daughter, a son, and a brother.

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CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Financing and Operation of Pulp and Paper Mills

General Construction News

Everett, Wash. — The Everett Pulp and Paper Company, manufacturer of book and writing papers, and other paper stocks, has approved plans for expansion and improvements in mill, including new one and multi-story addition for extensions in pulp division, with installation to include screenng, bleaching and other equipment. Water filter plant will be enlarged with new equipment. General contract has been awarded to the Howard S. Wright Company, 407 Yale Street North, Seattle, Wash., and work will proceed at once. Cost estimated close to $200,000, with equipment.

Kansas City, Mo. — Reynolds & Reynolds Company, Washington and Dudley streets, Dayton, Ohio, manufacturer of paper specialties, has acquired a two-story and basement building at 1424-26 Walnut street, Kansas City, and will improve and equip for new branch plant. It is proposed to have unit ready for service at early date.

Plymouth, N. C. — The North Carolina Pulp Company, manufacturer of sulphite fiber products, a division of Kieckhefer Container Company, Delair, N. J., has awarded general erection contract to William Muirhead Company, Durham, N. C., for new addition to mill, recently referred to in these columns, and will proceed with work at once. New structure will be used for expansion in pulp bleaching division, with section reserved for paper board manufacture, and is reported to cost in excess of $200,000, with equipment, instead of smaller sum, previously noted. An award for bleaching machinery has been let to the Improved Paper Machinery Corporation, Nashua, N. H.; a new boiler and auxiliary equipment will be furnished by the Combustion Engineering Company, Inc., 200 Madison avenue, New York, N. Y.; and water filter plant equipment by Charles Rohleder, 2134 Cherry street, Philadelphia, Pa. Contracts for other miscellaneous equipment will be placed soon. Entire project is scheduled for completion early in 1940.

Niagara Falls, N. Y.—Fire recently destroyed a stock of unbleached sulphite pulp at the mill of the International Paper Company, Buffalo avenue and Twelfth street, with loss reported about $30,000.

New York, N. Y.—The Normandy Container Corporation, recently organized with capital of 300 shares of stock, no par value, plans operation of a local plant for the manufacture of a line of paper boxes and containers. New company is represented by Samuel Kaufman, 521 Fifth avenue, attorney.

New York, N. Y.—The National Gypsum Company, 190 Delaware avenue, Buffalo, N. Y., manufacturer of wall board products, insulating board, etc., has completed plans for new addition to branch mill at East River and East 150th street, Bronx, New York, where an expansion and improvement program is now under way. New unit will be one and two-story, 100 x 800 feet, and will be used for storage, distribution and other operating service. It is estimated to cost close to $250,000, with equipment. General erection contract has been awarded to the George A. Fuller Company, 597 Madison avenue, New York, and work will proceed at once. This is part of expansion project of company, previously referred to in these columns, and for which a fund of about $1,000,000 is being arranged through bond issue.

Jarratt, Va.—The Johns-Manville Corporation, 22 East 40th street, New York, N. Y., manufacturer of wall board, insulating board, etc., has completed erection of new mill at Jarratt, where construction has been in progress for a number of months past, and plant will be placed in service at once. It will be used exclusively for the production of insulating board from wood pulp, and will have a rated output of about 100,000,000 square feet of finished material per annum. The plant consists of three main one-story units, 240 x 240 feet, 240 x 500 feet, and 240 x 500 ft., respectively, to be used as a wood pulp unit, dryer building, and main production and finishing mill, in order noted. It represents an investment of about $1,000,000 and was erected by the Consolidated Engineering Company, 20 East Franklin street, Baltimore, Md.

Rochester, N. Y. — The Rochester Envelope Company, 72 Clarissa street, manufacturer of commercial paper products, has plans under way for new one-story addition to plant, for which it is expected to ask bids on general contract at early date. Cost is reported close to $40,000, including equipment. Present capacity will be considerably increased.

Chicago, Ill. — The Spaulding Fibre Company, Inc., Milton, N. H., manufacturer of fiber board products, insulating papers, etc., has arranged for lease of space in building at 4757 North Ravenswood avenue, Chicago, totaling about 10,000 square feet, and will occupy for local factory branch, storage and distributing plant. Company will take possession at once and will remove present branch at 659 West Lake street, Chicago, to new location, where additional facilities will be provided.

Menasha, Wis. — The Marathon Paper Mills Company, Rothschild, Wis., has superstructure under way for new addition to branch mill on

River street, Menasha, used for the production of waxed and other processed paper stocks, previously referred to in these columns, and will push structure to early completion. It will be two-story and basement, 100- x 200 feet, reported to cost approximately $80,000, with equipment. General erection contract is being carried out by the Permanent Construction Company, 2712 North Holton street, Milwaukee, Wis. Frank Gruper is chief engineer for company, in charge.

Rochester, N. Y. — The Haloid Company, 6 Haloid street, manufacturer of photographic and other paper stocks, films, etc., has approved plans for new one-story addition to plant, reported to cost close to $40,000 with equipment. Structure will provide for considerable increase in present capacity. Erection contract has been let to Gorsline & Swan, Inc., Pearl street, Rochester, and work will be placed under way at once.

Bellingham, Wash. — The Puget Sound Pulp and Timber Company, Bellingham, is operating on a capacity schedule at its unbleached sulphite pulp mills, with orders on hand to insure continuance of this basis for a number of weeks to come. Employment is being given to a full working force.

Federal, Ill. — The Alton Boxboard Company, Alton, manufacturer of container board, wall board, straw board, etc., has awarded general contract to the Hellrung Construction Company, Alton, for new addition to mill at Federal, near Alton. It will be one-story, 115 x 690 feet, to be used in part for storage and distribution. Cost is estimated over $125,000, with equipment. Erection is scheduled to be placed under way at once. R. F. Hollis is chief engineer for company, in charge.

Clinton, Iowa — E. I. duPont deNemours & Co., Cellophane Division, duPont Building, Wilmington, Del., has awarded contract to the A. M. Paulson Company, Clinton, for excavating work on site of new mill on Highway No. 67, Clinton, previously referred to in these columns, and work is being placed under way. Contractor noted also will do grading and other ground work, preparatory to laying foundation for new mill. Other awards for different features of erection will be placed soon. Plant will be of large proportions, consisting of several one and multi-story units for general manufacture, storage and distributing buildings, power house, pumping station, machine shop and other miscellaneous buildings. It is understood that completion is scheduled early in 1941. Cost estimated in excess of $5,000,000, with machinery.

Toronto, Ont.—W. H. Morgan & Co., 925 Dufferin street, manufacturer of paper boxes and containers, and other paper goods, has acquired additional property and will use as site for new plant unit for the production of folding paper boxes and containers. Cost is reported close to $50,000, including equipment. It is understood that an architect will be selected soon to prepare plans for plant.

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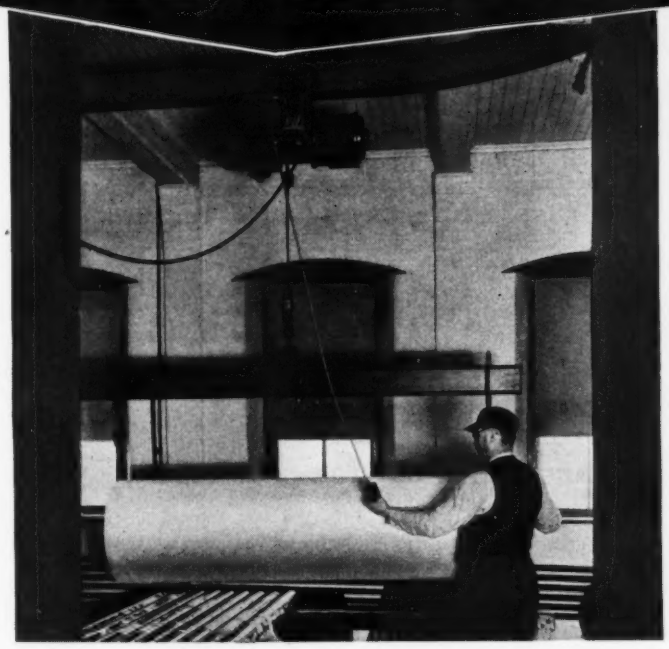

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PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

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Washington Correspondent

Vol. 109 New York, November 2, 1939 No. 18

COMING EVENTS IN PAPER INDUSTRY

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

LABOR ACT REVISION

In view of the dissatisfaction expressed by both management and unions with the National Labor Relations Act a revision of this law appears in prospect. The policy of the Federal Government is beginning a new phase, according to the view of union leaders. Current criticism of many union practices are cited as indications of a change in the Federal labor policy. The points especially enumerated by both the American Federation of Labor and the Congress of Industrial Organizations are (1) The start of a Federal movement to eliminate restraints of trade in the building industry, which allegedly has been imposed by unions. (2) Prosecution resulting in indictments charging local leaders of the International Brotherhood of Teamsters with violating anti-trust laws in a jurisdictional strike in Washington, D. C.

An indication that the present National Labor Relations Act is unsatisfactory to labor comes from James B. Carey, national secretary of the C.I.O. and president of the United Electrical, Radio and Machine Workers of America. In a statement filed with the Senate Labor Committee Mr. Carey said in part: "Our experience has taught us, in other connections, that a worthy law administered by persons who either intentionally or unintentionally subvert the purposes of that law can be a formidable means of opposition." Amendment of the Labor Relations Act was recommended by the Chamber of Commerce of the United States in a report issued October 28, prior to its submission to the special House committee which is to hold hearings on proposed changes in labor legislation. B. C. Heacock, head of the committee and president of the Caterpillar Tractor Company, stated that the act in its present form "constitutes one of the most serious threats to complete economic recovery" and that "legislative preferment of one class or group of our citizens over another has no place in our American system".

The report said that congressional committees had failed to report remedial legislation, although testimony before these committees overwhelmingly supported amendments as immediataely needed in the public interest. It is felt that the present House committee had been directed to proceed with hearings in response to public sentiment respecting the act.

The conclusions of the committee headed by Mr. Heacock stated that continuous study of the legislation over the four-year period of its existence had brought forth the following conclusions: "The act as administered by the Labor Relations Board has materially increased rather than decreased the number and intensity of strikes and other forms of industrial strife throughout the country. It has interfered with, rather than promoted, the amicable settlement of industrial disputes and the employment of duly constituted public agencies set up for that purpose. It has disrupted, rather than fostered, friendly relations between management and worker, with resulting discord among the employees, reduced efficiency in operation and increased costs.

"It has deprived large numbers of workers of the right which the law was presumed to protect, the right to bargain collectively through representatives of their own choosing. It has fomented class distinction and class hatred. By subjecting management to new risks and uncertainities, both as to rights and obligations, it has effectively prevented the expansion of existing facilities and the creation of new facilities, so essential to the economic growth and development of this country."

Among the many recommendations made for a change in the present Act the committee of the Chamber stated its reasons for the employer's right to certification as follows: With the revision of its rules on July 14 the Labor Board reversed its earlier procedure and for the first time recognized the right of an employer to petition for certification of the agency selected by his employees for collective bargaining purposes. Since this right may be exercised only in the event that conflicting demands are made on the employer by two or more labor organizations, each asserting authority to represent a majority of his employees, and as the board may in its discretion modify or revoke its present rule, we recommend that the act be amended to grant to an employer, upon whom any demand has been made for recognition of representatives for collective bargaining, the express right to petition the Labor Relations Board for determination and certification of the representatives selected by his employees for collective bargaining.

In reference to the right of free speech the committee report stated that in view of the Constitutional guaranty of freedom of speech there should be no necessity for suggesting that further guaranty in this respect be incorporated as part of a Federal statute. Nevertheless, decisions of the Labor Relations Board would appear to warrant an amendment of the Labor Relations Act for this purpose. We therefore favor an amendment to provide that the act shall not interfere with or diminish the right of free speech.

In stating that responsibility for defects in the Labor Board's administrative procedure rests in part on the language of the statute and in part on the rules which the board itself has prescribed, the committee favored amendments to the act which will remedy conditions which arise out of combination of inconsistent functions in one body alone handling so controversial a subject as the regulation of labor relations. In the public interest it was further recommended that the act be so amended as to provide that the board may issue complaints, alleging the use of unfair labor practices, only in those cases in which it clearly appears the public interest requires the board to undertake a proceeding.

New Wisconsin Mills Chartered

[FROM OUR REGULAR CORRESPONDENT]

MADISON, Wis., October 30, 1939—Two new incorporations filed with the Secretary of State within the last few days are indicative of increased paper mill activity in Wisconsin.

One of these is Outagamie Mills, Inc., chartered to make and sell paper, paper products and paper by-products. It will have a capital stock of 1,000 shares without nominal par value, and there will be a board of directors of five members. The incorporators are Milford J. Taylor and Andrew J. Johnson of Appleton, Wis., and Daniel E. McCarty of Kaukauna, Wis.

This corporaation will occupy the former Patten Paper Company mill at Kaukauna, Wis., now owned by the City of Kaukauna. The mill some years ago also was called the Outagamie Paper Company. The city acquired the mill after abandonment by the Patten company when it was placed on sale at auction to defray delinquent taxes. The water power site has been utilized by the City of Kaukauna for a new hydro-electric plant, now under construction. No definite announcement has been made as to operations, but it is believed the mill will be ready for production within two months.

The other is the Falls Paper and Power Company, Oconto Falls, Wis., incorporated with 1,000 shares of common stock of no par value. The incorporators are Dr. George E. Forkin and Margaret Taylor Forkin of Menasha, Wis., Janet Ewing of Green Bay, Wis., and Charlotte Smith of Neenah, Wis. The company will manufacture pulp, paper and paper products. While no definite announcement has been made, it is believed this corporation will take over the assets of the present Falls Pulp and Paper Company.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association:

COMPARATIVE MONTLY SUMMARIES[1]

Months	1939	1938	1937	1936	1935	1934
January	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	88.8%	76.3%	78.6%	80.5%	71.9%	58.2%
October	.....	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	72.3%	80.6%	81.3%	70.5%	.....
First 42 weeks	82.4%	71.0%	86.0%	80.0%	69.8%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1939		CORRESPONDING WEEKS, 1938	
September 16	91.8%	September 17	79.6%
September 23	93.4%	September 24	78.4%
September 30	96.1%	October 1	81.1%
October 7	93.4%	October 8	81.6%
October 14	97.3%	October 15	83.0%
October 21	98.0%	October 22	83.8%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Sept. 16, 1939	Sept. 23, 1939	Sept. 30, 1939	Oct. 7, 1939	Oct. 14, 1939	Oct. 21, 1939
0% to 50%	46	35	34	32	33	26
51% to 100%	260	270	268	270	252	128
Total Mills Reporting	306	305	302	302	285	194

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1935	62%	68%	68%	63%	61%	66%	62%
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1935	67%	71%	77%	71%	61%	66%
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	....	....	....	....

Week end. Sept. 16, 1939—79%
Week end. Sept. 23, 1939—80%
Week end. Sept. 30, 1939—82%
Week end. Oct. 7, 1939—84%
Week end. Oct. 14, 1939—83%
Week end. Oct. 21, 1939—84%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

Wertheimer Mansion Given to Convent

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., October 30, 1939—"Thilwerth," the huge mansion of the late M. A. Wertheimer at Kaukauna, Wis., has been given to the Franciscan Sisters of Holy Family Convent at Silver Lake, Wis., who will use it as a home for superannuated and invalid sisters, and later as a novitiate. The presentation was made by Mr. and Mrs. R. S. Wertheimer of Longview, Wash., who acquired the property after the death of Mr. Wertheimer's father. R. S. Wertheimer is secretary-treasurer of the Longview Fibre Company.

"Thilwerth" was built by the late Oscar Thilmany, founder of the Thilmany Pulp and Paper Company, Kaukauna, and was acquired in 1900 by Mr. Wertheimer, who succeeded Mr. Thilmany as president of the company.

It is situated on the Fox River, covers five large lots, and is attractively landscaped.

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Sulphate Pulping of Silver Fir

Effect of Chemical Concentration and of Wood Selection on Yield and Pulp Quality

By Mark W. Bray[1], J. S. Martin[2], and S. L. Schwartz[3].

Abstract

An investigation as to the suitability of silver fir (Abies amabilis) for the production of strong kraft and bleachable sulphate pulps has been made. The experiments reported include a study of the effect of concentration on yield and pulp quality from this species. With indirect steam heating, the lowest yield of screenings consistent with a high yield of screened pulps of maximum strength characteristics was obtained at an initial concentration of approximately 50 grams per liter of total chemicals in the cooking liquor including the moisture in the chips.

The effect of wood selection on yield and pulp quality was investigated. For the production of kraft pulps of high strength characteristics, wood taken from the upper portion of the trunk gave somewhat better pulps than that taken from the butt logs. Slabwood consisting of all sapwood gave better pulps than wood in which a greater proportion of heartwood was present.

[1] Member TAPPI, Senior Chemist, Forest Products Laboratory, Madison, Wis.
[2] Member TAPPI, Associate Engineer.
[3] Member TAPPI, Assistant Engineer.

This report presents the results of pulping experiments on silver fir *(Abies amabilis)*, by the sulphate process. The experiments were made to determine the suitability of silver fir for the production of strong kraft and bleachable sulphate pulps. In this work the initial concentration of total chemicals in the cooking liquor, expressed as sodium hydroxide and sodium sulphide, was varied from 80 to 15 grams per liter in increments of 5, 10, or 20 grams, depending upon the magnitude of the value for the total. In pulping with liquors of low concentration, additional digestions of longer duration were made when the screen-

FIG. 1.
Sample Cord of Silver Fir Pulpwood

ings were excessive, so that pulps of approximately the same yield could be compared.

The work was also designed to show any differences in pulp quality resulting from the selection of the raw material from different parts of the tree. Previous investigations on the pulping of certain European species *(1)* and the southern yellow pines *(2)*, *(3)* had shown that wood structure exerts a marked influence on the yield and quality of the pulp obtained.

The principal digestions were made in triplicate in an autoclave of 3.7 gallons capacity. Additional digestions were made in a 13-cubic foot digester in which were suspended four perforated steel baskets containing chips from different parts of the tree for pulping simultaneously. Thus pulps prepared under identical conditions were obtained for comparison. After determination of the yield of pulp and the consumption of cooking chemicals on the individual digestions, the identical autoclave, or basket-cooked pulps were thoroughly mixed in water suspension, pressed to a dryness of approximately 35 per cent, and stored in covered cans until used for physical, chemical, and bleach requirement tests.

TABLE I.—PHYSICAL CHARACTERISTICS OF THE SILVER FIR PULPWOOD

Weight of cord: (Basis 4-ft., unbarked split and whole logs, 128 cu. ft. gross volume)—		
Unbarked, as received	8938	lb.
Barked, as received	3310	lb.
Barked, oven-dry (Wt. barked x percentage non-volatile)	1760	lb.
(Solid vol. x density)	1875	lb.
Solid volume of wood in cord as received	79	cu. ft.
Composition of the cord—		
Logs split into quarters	12	
Logs split into thirds	1	
Logs split into halves	12	
Unsplit logs	8	
Total number of logs in cord	33	
Total number of pieces in cord	83	
Straightness (basis number logs in cord)—		
Nearly straight, less than a deviation of 0.5 inch	100.0	per cent
Logs with large protruding knots or bumps (Basis total in cord)	0	per cent
Knots, average number per log (Basis sample logs)—		
Small	9.5	
Medium	3.2	
Large	0.05	
Loss through barking—		
In weight (Basis unbarked logs, as received)	15.9	per cent
(Basis unbarked discs, oven-dry)	14.2	per cent
In solid-volume (Basis unbarked discs as received)	12.0	per cent
Specific gravity—		
(Basis discs, oven-dry weight, green volume)	0.380	
(Basis discs, oven-dry weight, oven-dry volume)	0.436	
Density—		
(Basis discs, oven-dry weight per cu. ft. green volume)	23.8	
Nonvolatile at 105 deg. C. (Basis discs as received)—		
Unbarked	53.2	per cent
Barked	53.2	per cent
Bark	54.1	per cent
Diameter: Of barked logs, maximum	18.5	in.
minimum	4.7	in.
average	10.2	in.
Of discs, average	9.9	in.
Of heartwood in logs, maximum	12.0	in.
minimum	2.0	in.
average	7.4	in.
Proportion of heartwood to total wood, by volume (Basis discs)	55.4	per cent
Age (Average of discs)	104	yr.
Rate of growth (Basis discs), average per inch	0	per cent
Logs containing heart rot (Basis total in cord)	20.8	rings

TABLE II.—CHEMICAL ANALYSIS AND WEIGHT OF UNIT VOLUME OF CHIPS OF THE SILVER FIR PULPWOOD

Cellulose	62.1	per cent
Alpha cellulose	44.2	per cent
Lignin	26.6	per cent
Total pentosans	10.5	per cent
Solubility in:		
Hot 1 per cent sodium hydroxide solution	9.1	per cent
Hot water	2.0	per cent
Alcohol-benzene	2.0	per cent
Ether	0.3	per cent
Hydrolysis number	18.9	
Size of chips	5/8	in.
Weight per cubic foot of wet chips	12.6	lb.
Nonvolatile at 105 deg. C.	65.0	per cent
Weight of oven-dry wood per cubic foot of wet chips	8.2	lb.

TABLE IV.—PULPING DATA AND PROPERTIES OF SILVER FIR SULPHATE PULPS. EFFECT OF CHEMICAL CONCENTRATION ON YIELD AND PULP QUALITY.

Digestion No.	Wood charged: Moisture, per cent	Wood charged: Weight, Moist, pounds	Wood charged: Weight, Oven-dry, pounds	Added: Concentration, Grams per liter: NaOH	Added: Concentration, Grams per liter: Na_2S	Added: Concentration, Grams per liter: Total	Added: Total effective alkali as NaOH	Added: Volume per 100 lbs. of wood, gals.	Added: Wood liquor ratio	Consumed: Ratio of combined to total alkali, %	Consumed: On oven-dry wood charged, %	Consumed: Total effective alkali as NaOH, %	Black liquor analysis: Density at 15°C., deg. Be.	Black liquor analysis: Total solids, %	Black liquor analysis: Heat value, B.t.u. per pound	Cooking[1] and yield date: Duration at maximum temperature 170° C., Hours	Yield: Screened pulp, Per cent	Yield: Screenings, Per cent	Yield: Total, Per cent	Pebble mill strength date on unbleached pulps. at 72 deg. F. and 65 per cent relative humidity: Time in pebble mill, Min.	Freeness (Schopper) C.c.	Tests made: Ream weight (25" x 40"—500), Lbs.	Burst factor, Per pound per ream	Tear factor, Per pound per ream	Folding endurance, Double	Tensile strength, Pounds per sq. in.	Solid fraction, Ratio	Stretch, Per cent	Bleaching data[2]: Ives reading: Standard bleach powder added, %	Red, Parts	Green, Parts	Blue, Parts	Chemical analysis[3]: Cellulose: Total, Per cent	Alpha, Per cent	Lignin, Per cent	Total pentosans, Per cent	Viscosity, Centipoises	Potassium permanganate number, Cc.
344	23.2	5.21	4.00	53.30	26.70	80.0	67.0	30.0	2.5	87.2	17.4	14.6	14.8	...	...	1.5	48.8	1.6	50.4	80	837	55.1	0.78	2.8	1086	3632	0.39	6.7	0	38	27	21	91.4	75.8	4.8	8.1	85.4	20.9
345										87.8	17.6	14.7	14.6				49.3	1.4	50.7	120	818	56.1	.92	2.2	1268	4873	.43	6.7	25	73	60	47	...	...	...	...	...	...	...
346										87.8	17.6	14.7	14.5							200	307	57.5	.92	1.5	1059	6320	.53	7.9											
Average										87.6	17.5	14.7	14.6	...	...	...	48.8	1.6	50.4	100	860	53.2	.79	2.8	1607	3783	.39	6.1	0	39	30	25	91.8	76.4	5.5	7.9	94.7	20.9
347	22.0	5.13	4.00	40.00	20.00	60.0	50.3	40.0	3.3	86.5	17.3	14.5	11.8	...	...	1.5	49.1	1.3	50.4	40	860	53.2	.79	2.8	1607	3783	.39	6.1	0	39	30	25	91.8	76.4	5.5	7.9	94.7	21.9
348										86.9	17.4	14.6	11.6				50.8	1.2	52.0	80	850	54.7	.92	2.3	1723	5070	.43	6.8	25	70	60	49	...	...	...	...	...	...	...
349										86.5	17.3	14.5	11.6				50.8	.4	51.2	120	835	55.9	.92	2.2	1099	5080	.43	6.9											
Average										86.6	17.3	14.5	11.7	...	...	...	50.2	1.0	51.2	140	782	54.5	1.01	2.1	1505	5815	.47	7.5											
																				160	420	56.7	1.04	1.6	1397	6150	.53	8.4											
																				200	255	58.3	.95	1.4	1321	6220	.56	7.4											
381	17.8	4.86	4.00	33.33	16.67	50.0	41.9	48.0	4.0	87.6	17.5	14.7	10.1			1.5	50.9	.4	51.3	40	860	57.9	.69	3.4	711	2865	.32	9.4	0	39	30	25	91.8	76.4	5.5	7.9	94.7	20.9
382										88.1	17.6	14.8	10.2	15.1	6887		51.0	.5	51.5	80	845	61.4	.82	2.9	950	3481	.38	9.5	25	70	60	49	...	...	...	...	...	...	...
383										87.6	17.5	14.7	10.1				51.0	.4	51.4	120	560	67.1	1.07	2.2	2552	6330	.46	9.0											
																				160	400	59.8	1.12	2.0	1990	5635	.48	9.4											
																				200	280	64.1	.99	1.9	....	6250	.51	8.4											
Average										87.8	17.5	14.7	10.1	...	...	...	51.0	.4	51.4																			

350										84.5	16.9	14.2	8.1				51.4	.9	52.3	40	865	56.3	.64	2.8	330	2670	.32	4.9	0	35	25	20	90.5	74.6	7.0	8.3	122.8	21.0
355	23.2	5.21	4.00	26.67	13.33	40.0	33.5	60.0	5.0	85.6	17.1	14.4	8.4	...	....	1.5	49.9	1.2	51.1	80	860	55.9	.77	2.8	1065	3357	.36	7.3	25	62	48	36	...	...	..	..	...	...
356										85.1	17.0	14.3	8.4				50.8	1.5	52.3	100	840	55.5	.90	2.6	1711	4410	.40	6.5												
																				120	835	56.7	.89	2.5	1426	4630	.40	7.1												
Average										85.1	17.0	14.3	8.3	...	....	...	50.7	1.2	51.9	140	835	59.1	.88	2.4	1579	3675	.40	6.4												
																				160	825	58.3	.81	2.3	1362	4182	.41	6.3												
																				120	865	53.9	.70	3.0	1083	3120	.33	6.9	0	34	24	18	87.4	74.4	9.8	7.3	...	...
376	16.9	3.61								85.7	17.1	14.4	6.3				52.0	2.4	54.4	140	860	55.1	.76	3.0	1326	3635	.35	6.6	25	51	36	27	...	...	..	..	...	...
389	16.8	3.61	3.00	20.00	10.00	30.0	25.1	80.0	6.7	85.7	17.1	14.4	6.4	9.3	6504	1.5	53.4	2.3	55.7	160	850	55.1	.83	2.2	1016	4292	.38	7.5										
390	17.8	3.65								87.3	17.5	14.6	6.4				50.3	6.1	56.4	180	835	57.1	.82	1.9	1208	4355	.38	6.9										
																				200	825	58.3	.82	1.9	819	4405	.39	7.1										
Average										86.2	17.2	14.5	6.4	...	....	...	51.9	3.6	55.5	280	240	56.7	.90	1.6	1084	5760	.49	6.4										
																				320	200	60.6	.79	1.3	764	5370	.53	5.5										
351										88.9	17.8	14.9	6.3				51.1	1.4	52.5	40	878	53.3	.68	2.7	974	2862	.35	6.0	0	33	23	19	88.4	72.8	7.4	8.6	104.7	21.9
361	23.2	3.91	3.00	20.00	10.00	30.0	25.1	80.0	6.7	85.6	17.1	14.3	6.4	...	....	2.5	51.3	1.1	52.4	80	865	55.9	.80	2.4	1287	3800	.38	6.5	25	62	46	36	...	...	..	..	...	...
362										85.6	17.1	14.3	6.3				51.2	1.8	53.0	120	855	52.4	.82	2.3	1190	4250	.40	6.6										
																				140	845	58.3	.85	2.2	1072	4320	.42	6.3										
Average										87.4	17.3	14.5	6.3	...	....	...	51.2	1.4	52.6	160	705	55.1	.99	1.8	1624	5250	.47	7.5										
																				200	450	56.3	.96	1.5	1538	6020	.49	6.9										
										84.6	16.9	14.2	5.5							140	860	57.1	.75	2.5	1124	3330	.35	6.0	0	31	21	17	80.6	68.2	11.4	7.3	...	...
387														7.7	6446		50.2	6.3	56.5	160	860	55.9	.78	2.4	1548	3510	.34	7.0	25	45	30	22	...	...	..	..	...	...
388	16.8	3.31	2.75	16.66	8.34	25.0	20.9	96.0	8.0	84.6	16.9	14.2	5.4			1.5	46.1	11.3	57.4	180	860	53.9	.76	2.7	1088	3205	.33	6.8										
																				200	860	55.5	.83	2.1	1092	4265	.38	6.9										
Average										84.6	16.9	14.2	5.5	...	....	...	48.2	8.8	57.0	280	785	55.1	.88	1.8	1081	5060	.42	6.6										
																				320	775	60.2	.80	1.6	1220	4930	.42	6.0										
										90.4	18.1	15.2	5.4							40	865	51.2	.63	3.1	246	2680	.33	5.8	0	33	23	19	88.9	74.2	7.6	7.2	76.4	22.1
371	23.0	3.57								88.5	17.7	14.8	5.5				51.6	1.3	52.9	80	855	52.4	.84	2.6	1166	4030	.37	7.0	25	60	45	32	...	...	..	..	...	...
374	16.9	3.31	2.75	16.66	8.34	25.0	20.9	96.0	8.0	88.5	17.7	14.8	5.5	8.1	6590	3.5	50.4	1.2	51.6	120	765	51.6	1.05	2.5	1073	5740	.44	7.8										
375																	51.1	1.3	52.4	140	605	50.0	1.10	2.2	1206	5860	.46	7.1										
																				160	530	53.5	1.06	2.2	1218	5920	.48	7.4										
Average										89.1	17.8	14.9	5.5	...	....	...	51.0	1.3	52.3	180	445	54.7	.96	1.8	1667	5810	.48	7.5										
																				200	260	55.9	.89	1.6	1072	6200	.51	6.8										
370	23.0	3.25	2.50	13.33	6.67	20.0	16.8	120.0	10.0	88.1	17.6	14.8	4.3	...	....	1.5	15.1	44.4	59.5	160	855	57.5	.72	2.2	959	4072	.39	6.3										
																				40	880	53.2	.69	2.7	927	3120	.34	5.5	0	32	23	18	89.4	73.8	8.9	7.3	...	21.7
367	16.1	2.98								88.1	17.6	14.8	4.5				50.3	2.5	52.8	80	865	53.5	.85	2.7	1096	4252	.38	7.0	25	56	40	30	...	...	..	..	...	...
372	21.4	3.18	2.50	13.33	6.67	20.0	16.8	120.0	10.0	88.1	17.6	14.8	4.3	...	....	4.0	49.9	2.6	52.5	120	830	53.5	.96	2.4	892	5710	.42	6.8										
373										88.1	17.6	14.8	4.5				49.9	2.5	52.4	140	780	55.5	.96	2.1	1087	5630	.44	7.3										
																				160	695	55.7	.97	2.0	1352	5968	.47	7.3										
Average										88.1	17.6	14.8	4.4	...	....	...	50.0	2.5	52.5	200	324	55.9	.92	1.6	885	6265	.53	5.8										
363	23.2	3.25								88.0	17.6	14.8	4.5				50.9	1.7	52.6	40	880	53.5	.63	2.6	766	2676	.33	5.8	0	32	22	17	89.2	74.2	8.1	6.9	...	22.0
368	23.0	3.25	2.50	13.33	6.67	20.0	16.8	120.0	10.0	91.6	18.3	15.4	4.5	...	....	5.0	49.7	3.2	52.9	80	865	56.3	.73	2.6	934	3425	.36	6.0	25	58	41	30	...	...	..	..	...	...
369	16.1	2.98								89.3	17.9	15.0	4.5				49.8	2.2	52.0	120	840	59.8	.81	2.6	1417	3785	.37	6.5										
377	21.4	3.18								89.3	17.9	15.0	4.3				50.3	2.0	52.3	140	730	54.7	1.02	2.0	1109	5020	.43	7.3										
																				160	809	58.5	.89	2.2	1108	4473	.41	7.0										
Average										89.6	17.9	15.0	4.5	...	....	...	50.2	2.3	52.5	200	330	55.1	.98	1.9	1082	6660	.53	6.3										
																				120	838	55.9	.89	2.4	1412	4355	.43	6.3	..	..	..	..	91.3	76.2	6.3	7.4	65.3	21.9
357	23.1	3.25	2.50	13.33	6.67	20.0	16.8	120.0	10.0	90.4	18.1	15.2	4.6	...	....	6.0	47.9	2.2	50.1	140	800	55.5	.90	2.2	1856	4665	.44	7.0										
																				160	609	55.9	1.02	2.0	1455	6400	.49	8.3										
																				200	385	57.5	.94	1.7	1293	6135	.51	7.6										
378	18.3	2.33								90.4	18.1	15.2	3.4				50.0	2.8	52.8	180	850	56.7	.87	2.4	1599	4380	.39	6.1	0	30	20	16	86.9	73.4	10.0	6.5	...	...
384	15.9	2.26	1.90	10.00	5.00	15.0	12.6	160.0	13.3	88.8	17.8	14.9	3.4	4.8	6506	6.0	49.5	4.1	53.6	200	778	56.3	.88	1.7	1234	4590	.44	7.9	25	44	28	20	...	...	..	..	...	...
385										90.4	18.1	15.2	3.4				50.0	3.7	53.7	280	335	58.3	.84	1.6	682	5210	.51	7.4										
Average										89.9	18.0	15.1	3.4	...	....	...	49.8	3.5	53.3	320	310	59.4	.87	1.5	1047	5700	.51	6.4										
379	18.3	2.33								92.0	18.4	15.4	3.4				51.4	2.4	53.8	160	850	54.7	.84	2.8	664	3670	.36	6.6	0	29	19	15	87.0	73.6	10.3	6.5	...	..
380			1.90	10.00	5.00	15.0	12.6	160.0	13.3	92.0	18.4	15.4	3.4	5.0	6912	7.5	50.6	3.2	53.8	180	845	55.5	.78	2.9	1327	3495	.35	6.5	25	46	31	22	...	...	..	..	...	.
386	15.9	2.26								92.0	18.4	15.4	3.4				51.6	1.9	53.5	200	835	55.9	.82	2.6	691	3745	.37	6.3										
																				280	275	58.7	.84	1.4	1017	5150	.50	4.8										
Average										92.0	18.4	15.4	3.4	...	....	...	51.2	2.5	53.7	320	160	59.1	.82	1.3	865	6045	.57	3.8										

[1] Cooking conditions: Except for changes in concentration and time of digestion as indicated, all digestions were made under the same conditions as follows—

Chemical added per hundred pounds of oven-dry wood:

Sodium hydroxide (Calculated as NaOH)	13.33 pounds
Sodium sulphide (Calculated as Na_2S)	6.67 pounds
Total chemicals	20.00 pounds
Total active alkali (Calculated as NaOH)	16.75 pounds

Maximum digestion temperature	170 deg. C.
Temperature-pressure increase period	1.5 hours
Heating	indirect steam

[2] Data obtained on unbeaten pulps.

TABLE V.—PULPING DATA AND PROPERTIES OF SILVER FIR (ABIES AMABILIS) SULPHATE PULPS. COMPARISON OF KRAFT PULPS FROM DIFFERENT PARTS OF THE TREE.

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Digestion designation No.	Location in tree	Wood: Moisture, Per cent	Wood: Weight: Moist, Pounds	Wood: Weight: Oven-dry, Pounds	Cooking[1] and yield data: Chemicals consumed: Ratio of combined to total alkali, Per cent	Chemicals consumed: On oven-dry wood, Per cent	Chemicals consumed: Total active alkali as NaOH, Per cent	Chemicals consumed: Black liquor: Density at 15 deg. C., deg. Be.	Chemicals consumed: Black liquor: Total solids, Per cent	Chemicals consumed: Black liquor: Heat value per pound residue, B.T.U.	Yield: Oven-dry screened pulp, Per cent	Yield: Oven-dry screenings, Per cent	Yield: Total	Pebble mill strength data on unbleached pulp. Tests made at 72 deg. F. and 65 per cent relative humidity: Time of treatment, Min.	Freeness (Schopper), Cc.	Ream weight (25x40—500), Points	Burst factor, Points	Tear factor, Points	Folding endurance, Double folds	Tensile strength, Lbs./sq. in.	Solid fraction,	Ratio Stretch, Per cent	Bleaching data[2]: Standard bleach powder added, Per cent	Ives reading: Red, Parts	Ives reading: Green, Parts	Ives reading: Blue, Parts	Chemical analysis[3]: Cellulose: Total, Per cent	Cellulose: Alpha, Per cent	Lignin, Per cent	Total pentosans, Per cent	Viscosity, Centipoises
381	Entire tree mixture	17.8	4.86	4.0	87.6	17.5	14.7	10.1	15.1	6887	50.9	0.4	51.3	40	860	57.9	0.69	3.4	711	2865	0.32	9.4	0	39	30	25	91.8	76.4	5.5	7.9	94.7
382					88.1	17.6	14.8	10.2			51.0	.5	51.5	80	845	61.4	.82	2.9	950	3481	.38	9.5	25	70	60	49	...	...	..	..	...
383					87.6	17.5	14.7	10.1			51.0	.4	51.4	120	660	59.1	1.07	2.2	3552	5480	.46	9.4									
														140	550	61.6	1.01	2.1	2553	6330	.47	9.0									
														160	400	59.8	1.12	2.0	1990	5635	.48	9.4									
Average					87.8	17.5	14.7	10.1	...	....	51.0	.4	51.4	200	280	64.1	.99	1.9	....	6250	.51	8.4									
391	Top logs	18.5	4.91	4.0	89.0	17.8	14.9	10.5	15.3	6804	52.1	.7	52.8	40	850	48.8	1.19	2.0	1386	5275	.41	7.1	0	38	27	23	89.5	73.8	7.0	8.6	...
392					89.0	17.8	14.9	10.5			52.6	.7	53.3	80	765	48.8	1.27	2.0	2169	6820	.45	9.0	25	62	49	37	...	...	..	..	...
393					89.0	17.8	14.9	10.6			53.5	.4	53.9	120	415	47.6	1.27	1.6	2542	8330	.50	8.8									
														140	335	47.6	1.22	1.4	1688	7810	.49	7.9									
														160	235	46.9	1.26	1.4	1395	8300	.53	6.6									
Average					89.0	17.8	14.9	10.5	...	....	52.7	.6	53.3	200	225	52.4	.93	1.2	1080	5885	.51	5.4									
2435–1	Top logs	19.0	113.90	92.2	80.9	16.2	13.6	10.6	...	....	47.8	.5	48.3	40	865	51.2	.70	3.0	980	3820	.36	8.3	0	38	28	24	91.6	75.6	5.5	8.3	81.0
														80	860	52.8	.88	2.8	1463	4410	.36	9.8	25	68	56	45	...	...	..	..	...
														120	845	54.7	.91	2.6	1388	5320	.42	8.5									
														160	815	55.5	.91	2.0	1917	4770	.44	6.8									
														180	440	53.5	1.07	1.5	1374	7230	.52	8.5									
														200	...	57.9	1.03	2.0	1534	5550	.45	7.9									
2435–2	Top logs (Basket cooks)	19.0	4.82	3.9	80.9	16.2	13.6	10.6	...	....	52.5	.5	53.0	40	865	51.2	.74	2.9	275	3389	.34	9.3	0	40	29	24	91.2	74.9	5.5	8.9	99.6
2435–3											53.0	.5	53.5	80	815	51.2	1.07	1.9	871	5760	.45	7.8	25	65	53	43	...	...	..	..	...
														120	795	52.8	1.06	1.9	1105	6220	.44	8.5									
														140	745	51.6	1.12	1.8	1508	6400	.46	8.0									
														160	415	50.0	1.11	1.7	1877	6220	.47	7.3									
Average											52.8	.5	53.3	180	400	53.5	1.08	1.7	1316	5550	.44	7.5									
394	Butt logs	14.3	4.67	4.0	86.6	17.3	14.5	10.6	15.4	6784	50.3	.2	50.5	40	865	53.9	.69	3.0	250	3345	.35	10.3	0	39	28	22	95.7	80.9	1.6	5.2	28.2
395					86.6	17.3	14.5	10.6			50.4	.2	50.6	80	855	52.8	.86	2.8	659	3700	.38	9.1	25	70	56	44	...	...	..	..	...
396					86.6	17.3	14.5	10.6			50.7	.2	50.9	120	855	54.7	.88	2.5	919	4175	.39	7.4									
														140	800	56.3	.99	2.3	1175	4600	.42	10.4									
														160	620	55.1	1.03	1.9	1073	5440	.46	10.5									
Average					86.6	17.3	14.5	10.6	...	....	50.5	.2	50.7	200	215	55.9	1.05	1.6	1504	6120	.50	8.3									
2439	Butt logs	14.0	116.30	100.0	76.6	15.3	12.8	12.4	...	....	...	..	...	40	865	48.4	.79	3.0	365	2930	.33	6.7	0	40	30	24	93.6	77.8	2.4	7.9	85.2
														80	845	54.4	.84	2.8	667	4070	.36	6.8	25	75	67	60	...	...	..	..	...
														120	830	54.4	.89	2.5	1090	4360	.39	7.2									
														160	740	56.5	.90	2.1	1303	5450	.41	7.6									
														180	330	51.2	.97	1.6	838	5820	.47	6.1									
														200	...	55.9	.89	2.0	2026	5090	.44	9.3									
397	Slabs (sapwood)	15.7	4.75	4.0	84.3	16.9	14.1	10.2	...	....	51.0	.4	51.4	40	855	51.6	.73	3.3	1057	3190	.36	8.8	0	38	27	21	90.6	74.0	5.1	5.8	...
398					83.8	16.8	14.0	10.1			51.0	.4	51.4	80	845	52.4	.84	2.9	1401	4140	.39	7.8	25	74	63	52	...	...	..	..	...
399					83.8	16.8	14.0	10.2			51.1	.3	51.4	120	720	53.9	1.13	2.5	2201	6250	.45	9.8									
														160	442	53.5	1.06	2.0	1302	6360	.50	8.8									
Average					84.0	16.8	14.0	10.2	...	....	51.0	.4	51.4	200	240	52.8	1.06	1.7	1854	6470	.53	7.3									
2441	Slabs (sapwood)	16.1	119.30	100.0	83.3	16.7	14.0	9.1	...	....	50.3	.0	50.3	40	855	54.3	.54	3.5	50	2030	.30	7.0	0	41	31	26	93.2	76.7	3.8	7.0	...
														80	855	53.5	.65	3.6	316	2800	.35	6.0	25	75	68	60	...	...	..	..	...
														120	840	55.9	.82	3.0	1285	3780	.38	7.1									
														200	590	54.7	.97	2.4	1058	4460	.42	7.9									
														240	335	59.4	1.02	2.1	1704	6400	.49	8.8									
														280	210	59.8	.99	1.7	1059	5420	.53	8.9									
400	Log centers (heartwood)	14.7	4.69	4.0	83.3	16.7	14.0	10.4	...	....	50.5	.1	50.6	40	855	52.0	.92	2.4	1313	4392	.40	8.7	0	40	29	24	92.2	75.2	5.0	10.4	...
401					83.3	16.7	14.0	10.4			50.2	.1	50.3	80	820	52.8	.97	2.3	713	4973	.42	9.5	25	70	60	50	...	...	..	..	...
402					83.3	16.7	14.0	10.4			49.9	.2	50.1	120	805	54.7	1.01	2.4	1423	5404	.45	9.5									
														160	615	55.5	1.14	1.6	1033	6728	.49	7.1									
Average					83.3	16.7	14.0	10.4	...	....	50.2	.1	50.3	200	265	56.7	1.06	1.9	1317	7665	.54	8.0									

2442 Log centers (heartwood)... 15.8 118.80 100.0 80.0 16.0 13.4 10.0 ... . 48.8 .1 48.9

| | | |

decrease as this pulping variable is further decreased. In addition, the bleach requirement indicates a minimum at this point followed by a marked increase with further decrease in chemical concentration. The cellulose and alpha cellulose content of the pulps also show a maximum at the concentration of 50 g. per liter. Since the most favorable results were obtained at this concentration, these cooking conditions were employed in further studying the effects of growth variables on yield and pulp quality relative to the production of strong kraft pulps from this species: Since all the digestions were effected with indirect steam heating the concentration of 50 g. per 1. is not low. In fact, this value approximates mill operation. Of course, for the production of bleachable sulphate pulps where greater amounts of chemicals are required this low concentration might not be economically feasible. Hence, with the larger volumes of liquor employed in making the bleachable sulphate pulps the initial concentration of total chemicals, expressed as NaOH and Na_2S, was increased to 60 and 70 g. per l. (Table VI).

Pulping for longer periods at the lower concentrations in order to obtain yields equal to those made at the higher concentrations resulted in pulps of somewhat lower strength characteristics and higher bleach requirements.

Effect of Wood Selection on Yield and Quality of Kraft Pulps

For investigating the effect of wood selection from different parts of the tree, all the kraft digestions were made under the same conditions, namely, those resulting in the best pulps from the just described study of chemical concentration. Top and butt logs, slabwood consisting entirely of sapwood, and center portions, consisting of heartwood, were pulped separately. The results of these experiments are reported in Table V.

As shown in Table III, logs taken from the upper portions of the tree are lower in density, have a more rapid growth rate, and contain a lower percentage of heartwood. In addition, from measurements made on other species, notably the southern yellow pines, *(3)* the percentage of springwood, which varies inversely with the density, increases with distance above the stump. Unfortunately accurate measurements on the proportion of this type of wood growth were not made on the identical logs under consideration.

The data in Table V indicate that the highest yield of pulp was obtained from logs taken from the upper portion of the tree. A slight advantage in yield is also shown for slabwood in comparison with heartwood.

The strength data show higher bursting and tensile strengths and folding endurance, but lower resistance to tear for top logs in comparison with butt material. Slabwood produced a pulp of higher tearing strength than that obtained from the center heart-containing portion of the tree. Neither of these two latter types of wood excelled in other strength properties. There was no advantage so far as bleach requirement is concerned between the upper or lower portions of the tree. Slabwood pulps showed an advantage over heartwood pulps in bleach requirement and in pentosan removal.

In general, so far as pulp yield and strength are concerned, top logs and slabwood were somewhat superior to butt logs and heartwood as raw material for kraft pulping.

Effect of Changing Cooking Conditions on Yield and Quality of Bleachable Sulphate Pulps

For this part of the investigation, in one instance, the initial concentration was changed from 60 to 70 g. per l. and all other cooking conditions were held constant. In a second instance the total chemicals were increased from 30 to 34.2 lb. per hundred lb. of oven-dry wood charged. Again all other conditions were maintained unchanged for the digestions in this series.

Increasing concentration from 60 to 70 g. per l. resulted in a very slight (1 per cent), but nevertheless definite, decrease in yield, a small decrease in bleach requirement, a slight increase in cellulose and alpha-cellulose content, and in bursting and tensile strengths, but a decrease in resistance to tear and in folding endurance.

TABLE III.—PHYSICAL CHARACTERISTICS OF SILVER FIR PULPWOOD; SAMPLES TAKEN FROM DIFFERENT LOCATIONS IN THE TREE (SHIPMENT 1430)

Tree designation	Number logs in tree	Log No.[1]	Number pieces in log	Dryness[2] of log Per cent	Average diameter of log[3] Inches	Specific gravity[3] (O.D. weight/A.D. volume)	Age of log[3] Years	Growth rate[3] Rings per inch	Heartwood by volume[3] Per cent	Knots[4] Small	Knots[4] Medium	Knots[4] Large	Color of wood—Ives readings: Heartwood Red	Heartwood Green	Heartwood Blue	Sapwood Red	Sapwood Green	Sapwood Blue
										No. per log			Parts			Parts		
A	19	2	4	57.8	14.5	0.400	163	22	61	3	0	0	64	51	40	69	56	45
		11	3	53.7	11.4	.369	96	17	63	5	8	0	66	52	44	73	60	51
		18	2	47.8	6.8	.367	52	15	35	14	9	0	69	57	47	75	62	54
B	20	1	4	63.0	13.2	.407	184	28	69	3	1	0	61	46	38	63	48	38
		10	4	62.7	11.3	.350	118	21	83	13	3	0	64	48	41	67	53	44
		19	2	53.2	6.2	.379	46	15	53	25	12	0	67	54	43	68	53	45
C	13	1	2	63.1	9.1	.466	170	38	67	0	0	0	64	47	37	..	..	..
		7	2	58.2	8.7	.377	108	25	63	10	0	0	65	51	41	68	52	42
		13	1	40.5	5.9	.358	52	18	64	14	5	0	68	56	46	66	52	42
D	6	2	2	63.9	8.4	.395	157	37	70	2	0	0	67	53	44	..	..	..
		5	1	55.0	7.4	.370	125	34	64	10	3	0	64	51	42	..	..	..
E	24	1	5	53.9	18.9	.357	216	23	54	4	0	0	66	48	40	64	48	38
		12	4	50.2	14.7	.304	75	10	62	8	1	1	64	49	42	68	55	47
		24	1	40.5	6.0	.341	29	10	34	15	13	0	67	53	44	68	53	43
F	10	2	1	48.8	8.3	.418	87	21	45	15	0	0	63	48	39	67	51	42
		5	1	40.7	7.8	.353	67	17	35	15	1	0	65	51	42	65	50	40
		10	1	36.2	5.6	.346	36	13	23	17	3	0	67	56	46	67	55	46
G	14	2	4	64.0	13.0	.441	129	20	57	3	0	0	62	46	37	63	48	37
		8	2	57.5	11.8	.427	100	17	52	8	0	0	65	48	39	71	58	47
		14	2	52.8	10.0	.378	72	14	55	5	5	0	65	50	40	70	56	46
Average				53.2	9.9	0.380	104	21	55	9.5	3.2	0.05	65	51	42	68	54	44

[1] The number designates the position of the log with reference to the butt. The logs selected from each tree were either the first or second log from the top and bottom and approximately the middle log.
[2] Nonvolatile matter at 105 deg. C. as determined from sample disc.
[3] As determined from sample disc cut from middle of log.
[4] Small knots 1 inch in diameter or less; medium, 1 to 2 inches; large, more than 2 inches.

TABLE VI.—PULPING DATA AND PROPERTIES OF SILVER FIR (ABIES AMABILIS) SULPHATE PULPS. COMPARISON OF BLEACHABLE PULPS FROM DIFFERENT PARTS OF THE TREE.

Digestion, No.	Location of wood in tree	Wood: Moisture, Per cent	Wood: Charged Weight: Moist, Pounds	Wood: Charged Weight: Oven-dry, Pounds	Cooking[1] and yield data: Chemicals Charged Concentration: NaOH, gm./liter	Concentration: Na_2S, gm./liter	Concentration: Total, gm./liter	Per 100 pounds O.D. wood: NaOH, Pounds	Na_2S, Pounds	Total, Pounds	Total active alkali as NaOH, Pounds	Volume, Gallons	Consumed: Ratio of combined to total alkali, Per cent	On oven-dry wood, Per cent	Total active alkali as NaOH, Per cent	Density of black liquor at 15 deg. C., deg. Be	Yield: Oven-dry screened pulp, Per cent	Oven-dry screenings, Per cent	Total, Per cent	Pebble mill strength data (unbleached pulps). Tests made at 72 deg. F. and 65 per cent relative humidity: Time in pebble mill, Min.	Freeness (Schopper) Cc.	Ream weight (25×40—500) Pounds	Burst factor, Points	Tear factor, Points	Folding endurance, Double folds	Tensile strength, Lbs./sq. in.	Solid fraction, Ratio	Stretch, Per cent	Bleaching data[2]: Ives readings: Standard bleach powder, Per cent	Red, Parts	Green, Parts	Blue, Parts	Chemical analyses[2]: Cellulose: Total, Per cent	Alpha, Per cent	Lignin, Per cent	Total pentosans, Per cent	Viscosity, Centipoises
364	Mixture of entire tree	21.8	5.12	4.00	45.0	15.0	60.0	25.65	8.55	34.2	30.0	68.4	64.3	22.0	19.3	11.0	43.5	0.0	43.5	40	860	58.3	0.61	2.9	1023	2972	0.36	5.3	0	47	35	31	95.4	78.5	0.8	5.7	15.5
365													64.7	22.1	19.4	11.0	43.7	.0	43.7	80	840	59.4	.63	2.5	1112	3078	.38	5.6	20	81	78	73					
366													64.7	22.1	19.4	11.0	42.9	.0	42.9	100	835	61.8	.62	2.8	752	3360	.38	5.3	22.5	84	80	75					
																				120	832	61.4	.70	2.3	1106	4260	.42	6.4	25	84	81	77					
																				140	813	59.6	.75	2.3	1092	4250	.43	6.5	30	86	83	80					
Average													64.6	22.1	19.4	11.0	43.4	.0	43.4	160	800	59.8	.73	2.2	1142	4250	.42	6.8									
																				200	660	61.0	.74	1.8	866	4775	.47	6.9									
358	Mixture of entire tree	19.9	4.99	4.00	52.5	17.5	70.0	22.5	7.50	30.0	26.35	51.4	71.4	21.4	18.8	12.6	42.9	.1	43.0	40	850	49.1	.66	3.5	568	2700	.35	5.0	0	45	34	30	94.3	78.4	.9	6.1	19.7
359													71.4	21.4	18.8	12.6	43.4	.1	43.5	80	840	49.4	.77	3.3	837	3420	.39	5.9	20	82	77	70					
360													72.4	21.7	19.0	12.6	43.9	.0	43.9	100	830	57.5	.74	2.4	948	3765	.41	6.0	22.5	82	79	75					
																				120	820	59.5	.73	2.4	1171	3930	.41	6.3	25	84	82	79					
																				160	740	58.3	.76	2.1	864	4270	.45	6.5	30	86	84	82					
Average													71.7	21.5	18.9	12.6	43.4	.1	43.5	200	730	61.8	.72	2.1	834	4390	.48	6.6									
352	Mixture of entire tree	22.3	5.15	4.00	52.5	17.5	70.0	25.65	8.55	34.2	30.0	58.6	64.5	22.1	19.4	12.4	43.1	.0	43.1	40	850	52.4	.64	2.3	509	3225	.35	5.7	0	43	34	29	96.2	80.4	.9	5.6	13.5
353													64.9	22.2	19.5	12.4	42.2	.1	42.3	80	820	52.0	.72	2.3	434	3805	.40	7.1	20	81	80	77					
354													64.3	22.0	19.3	12.4	41.9	.0	41.9	100	698	52.6	.83	1.8	801	4507	.45	7.0	22.5	83	81	78					
																				120	482	49.8	.86	1.6	597	5040	.48	7.4	25	85	83	80					
Average													64.6	22.1	19.4	12.4	42.4	.0	42.4	160	265	51.6	.75	1.3	387	5120	.53	6.0	30	84	84	82					
2436–2	Top logs (basket)	17.3	4.53	3.75	52.5	17.5	70.0	25.65	8.55	34.2	30.0	58.6	55.6	19.0	16.7	10.8	46.9	.0	46.9	40	855	53.9	.71	3.5	188	3480	.37	7.5	0	46	36	31	95.3	79.6	.7	6.0	26.9
–3																	46.0	.0	46.0	80	835	56.7	.82	2.6	689	3860	.41	8.5	20	82	78	75					
																				120	830	53.5	.77	2.6	412	3710	.40	9.0	22.5	84	79	76					
																				140	815	53.2	.84	2.3	897	4600	.42	9.3	25	85	80	78					
																				180	370	57.1	.91	1.8	864	5510	.53	8.0	30	85	82	80					
Average																	46.5	.0	46.5	200	155	52.0	.87	1.2	810	5870	.54	6.0									
2438	Butt logs	13.9	116.20	100.00	52.5	17.5	70.0	25.65	8.55	34.2	30.0	58.6	49.1	16.8	14.7	10.6	43.0	.0	43.0	40	855	52.0	.60	2.8	121	2780	.36	7.8	0	50	41	36	96.6	80.2	.7	4.8	23.3
																				80	780	50.4	.89	2.1	887	4910	.44	7.4	20	83	81	77					
																				120	535	50.4	.95	1.8	866	5950	.51	6.7	22.5	84	81	79					
																				160	260	52.0	.90	1.5	571	6100	.54	9.4	25	84	82	81					
																				180	205	55.5	.76	1.3	682	4960	.56	5.1									
2440	Slabs (sapwood)	16.3	119.50	100.00	52.5	17.5	70.0	25.65	8.55	34.2	30.0	58.6	51.1	17.5	15.3	10.4	44.7	.0	44.7	40	850	54.7	.55	3.1	91	2595	.34	5.8	0	49	41	35	97.4	80.2	.7	4.6	20.1
																				80	825	54.3	.72	2.3	611	4030	.39	7.1	20	83	82	78					
																				120	810	55.1	.77	2.4	516	3850	.38	6.9	22.5	84	82	79					
																				160	470	56.7	.86	1.8	588	3820	.42	7.1	25	86	83	81					
																				180	375	58.3	.79	1.8	600	4410	.47	8.4	30	86	85	83					
2443	Log centers (heartwood)	16.5	119.70	100.00	52.5	17.5	70.0	25.65	8.55	34.2	30.0	58.6	51.3	17.5	15.4	10.7	43.1	.0	43.1	40	835	56.3	.65	2.7	947	3072	.35	6.5	0	49	40	34	96.1	79.6	1.1	5.4	16.6
																				80	825	57.1	.77	2.4	1072	3693	.37	7.8	20	82	80	74					
																				120	800	56.3	.80	2.2	1200	5024	.46	7.3	22.5	82	80	75					
																				160	798	58.7	.82	2.3	1140	4368	.42	8.7	25	83	81	78					
																				200	460	57.5	.86	2.0	743	4890	.48	7.8	30	85	82	80					
																				240	510	60.2	.84	1.6	312	4958	.48	6.5									

[1] Cooking conditions: Temperature-pressure increase period..... 1½ hours
Duration at maximum temperature..... 2½ hours
Maximum digester temperature..... 170 deg. C.

[2] Data obtained on unbeaten pulps.

Increasing the ratio of total chemical charged from 30 to 34.2 per cent resulted in a decrease in pulp yield, in bleach requirement, and in folding and tearing strength, and an increase in bursting and tensile strengths. In addition, the cellulose and alpha-cellulose contents were higher in the pulps cooked with the higher chemical ratio.

EFFECT OF WOOD SELECTION ON YIELD AND QUALITY OF BLEACHABLE SULPHATE PULPS

For the production of bleachable sulphate pulps, where yields are lower than in kraft pulping, selection of raw material is probably not so important so far as pulp strength and bleach requirement are concerned. However, here again the upper logs and the slabwood gave the highest yield of pulp of practically equal bleachability.

Conclusions

Silver fir *(Abies amabilis)* is satisfactory for the production of both strong kraft and easy-bleaching sulphate pulps.

Decreasing concentration of chemicals in the cooking liquors from 80 to 20 g. per l. resulted in a kraft pulp of maximum yield and strength properties at approximately 50 g. per l., total initial concentration when the digester was heated with indirect steam. Cooking to equal yield by increasing the time of digestion for lower chemical concentrations did not result in pulps of equal strength and bleach requirement to those made at this particular concentration.

Proper selection of wood is beneficial to the production of kraft pulps of highest yield and strength properties.

Literature Cited

(1) Klem, Gustav G., Reports of the Norwegian Experiment Station, no. 17, vol. V, part 2 (1934).
(2) Curran, C. E., *Paper Trade J.* 103, No. 11:37 (Sept. 10, 1936).
(3) Bray, M. W. and Curran, C. E., *Paper Trade J.* 105, no. 20:39 (Nov. 11, 1937).
(4) Pew, Knechtges and Schafer, Forest Products Laboratory Report L-168-7, Problem D-151 (July 19, 1935).
(5) Method no. 111, July 1933, revision of the Forest Products Laboratory Manual of Standard Testing Methods for Wood, Pulp, Stuff and Paper.

Review Of Paper Industry Literature

Abstracts Compiled By the Abstracts and Bibliography Committee of the Technical Association of the Pulp and Paper Industry, A. Papineau-Couture, John F. Ohlson, C. E. Peterson and Clarence J. West, Chairman.

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C. for 10 cents each. Send currency, not stamps.

Paper Specialties

Roofing or Sheet Product. Clements Batcheller. U. S. pat. 2,122,192 (June 28, 1938).—Vegetable fibers are precoated with asphalt emulsion, the asphalt-covered fibers are coated with colloidal clay of the nature of bentonite, the fibers are mixed while plastic with hydraulic cement and water to form a plastic mass, which is rough-formed and then subjected to substantial pressure to form a dense, hard product. (Cl. 18-47.5).—A.P.-C.

Weatherboarding. Lester Kirschbraun, assignor to The Patent and Licensing Corporation. U. S. pat. 2,115,172 (April 26, 1938).—A fibrous, water-resistant, thermoplastic sheet, such as that made on a paper machine from a suitable mixture of paper stock and an aqueous dispersion of asphalt, is embossed or moulded in such a manner as to simulate courses of bricks. This is suitably effected by pressing between suitably shaped male and female dies. (Cl. 20-5).—A.P.-C.

Process of Impregnating and Coating Roofing Felt. John Wesley Pearl, assignor to The Barrett Company. U. S. pat. 2,117,355 (May 17, 1938).—The invention consists in a four-step process involving the following successive operations: (1) repeatedly immersing the felt in a bath of asphalt of a melting point of from 100° to 200° F. maintained at 375° to 475° F. to impregnate the felt with asphalt; (2) cooling the impregnated felt by prolonged exposure to the air immediately after it emerges from the asphalt bath; (3) passing the impregnated felt over and under rolls located above and below the surface of a bath of asphalt of a melting-point of 175° to 225° F. maintained at 410° to 460° F.; (4) applying to the felt after it has emerged from the coating bath a stream of liquid bituminous coating material having a melting point of 200° to 230° F. and maintained at 390° to 435° F., which is lower than the temperature of the coating bath. (Cl 91-70).—A.P.-C.

Process and Apparatus for the Preparation of Roofing Felt. Henry A. Ellis and Wm. A. Slattery, assignors to The Philip Carey Manufacturing Co. U. S. pats. 2,113,297 and 2,113,298 (April 5, 1938).—*No. 2,113,297*—Cellulose raw materials are beaten and subjected to the action of cylindrical rods which readily roll over one another under their own weight, so that the material is defibered without material reduction in fiber length. *No. 2,113,298*—Fibers prepared by the process and in the apparatus disclosed in the preceding patent are used for making roofing felt. (Cl. 92-3; 92-20).—A.P.-C.

Process and Apparatus for Coating Roofing. Clarence R. Eckert, assignor to The Barrett Company. U. S. pat. 2,111,761 (March 22, 1938).—Coating material, which may be asphalt, bitumen, or other coating liquid, either alone or mixed with bronzing powder or other pigment, is automatically applied to a moving sheet of roofing base by means of a suitably constructed liquid-delivery spout such as a spraying gun. The coating may thus be confined to desired well-defined areas or lanes, thereby producing a design or geometrical configuration. (Cl. 41-1).—A.P.-C.

Method of Surfacing Roofing Material. Charles T. Limerick, assignor to The Patent and Licensing Corporation. U. S. pat. 2,111,565 (March 22, 1938). Grits of different colors are deposited on different areas comprising the exposed surface of a sheet of roofing. The excess non-adherent grit is recovered, and the recovered grit of commingled colors is de-

posited exclusively on the portion of the roofing which will be covered over when the roofing is in position on the roof. (Cl. 91-68).—A.P.-C.

Shadowless Roofing Product? Process and Machine for Making the Same. Grover Williford, assignor to United States Gypsum Company. U. S. pat. 2,112,819 (March 29, 1938).—Surfacing granules are fed on to impregnated and coated roofing over a deflector plate the angular position of which is adjusted so that the granules fall on the web at such an angle that the pressure roll lays them flat. (Cl. 91-68).—A.P.-C.

Roofing. George Knapp, assignor to Certain-teed Products Corporation. U. S. pat. 2,112,898 (April 5, 1938).—Any desired design may be made on composition roofing by producing a composition covering element with certain areas surfaced and coated with a normally thick coating, and certain other areas in the pattern unsurfaced and only coated with a relatively thin coating. (Cl. 108-7).—A.P.-C.

Roofing and Siding Material. Norman P. Hashberger, assignor to Bakelite Building Products Company, Inc. U. S. pat. 2,112,194 (March 22, 1938).—A colored shingle element comprises a water-resistant flexible base such as bitumen-coated fabric to which is adhesively secured a granular surface roughening material, and the exposed surface is coated with a hardened and weather-resistant colored material such as a substantially water-insoluble, quick-drying lacquer, which may contain a cellulose ester. (Cl. 108-7).—A.P.-C.

Carbon Paper. Heinrich Rinderknecht. Fr. pat. 826,767 (April 8, 1938).—The front of the paper is covered with an aqueous solution or emulsion of a substance forming elastic films and in a separate operation the back is impregnated with a like aqueous solution or emulsion containing a coloring material (carbon black) which does not precipitate the film-forming material, and, if necessary, a wetting or dispersing agent such as Igepon T. The film-forming material may be latex.—A.P.-C.

Machines for Making Tissue Papers. Enright A. Ellis. Paper Mill 61, No. 26: 116-118, 122 (June 25, 1938).—A review of the essential characteristics that distinguished the several types of machines for the production of tissue papers.—A.P.-C.

Laminated Paper. Dallas Grant. Brit. pat. 483,957 (April 28, 1938).—This is made by applying an adhesive coating of asphalt to one side of a travelling web of paper, e.g., by means of a roll dipping in asphalt in a trough, rotating a cylindrical rod in contact with the coated side of the web and in a direction opposite to the travel of the web as it leaves the coating station and pressing the coated side of the web against a second travelling web of paper. The compound sheet formed by union of the webs between pressure rolls is passed over cooling rolls and wound up. The method may be applied to the manufacture of compound papers having three or more plies.—A.P.-C.

Compound Insulating Paper. British Thomson-Houston Company, Ltd. Brit. pat. 475,756.—Layers of perforated paper coated with synthetic resin varnish are bonded together under heat and pressure to form electrically-insulating material. The perforation in one layer may be staggered relatively to those in an adjacent layer. The perforations may be large rectangular ones or needle size, produced by passing the paper between perforating rollers. The varnish may be phenol-formaldehyde resin dissolved in an equal quantity by weight of alcohol.—A.P.-C.

Paper Containing Lubricant and Mica, Etc. T. H. Thompson. Brit pat. 473,314.—A leaf spring liner comprises a flexible porous strip of fibrous material having a lubricating material and a foliate mineral material embedded in the body thereof. The liner may be formed on a fourdrinier machine from a pulp furnish containing material such as mica or vermiculite, and is dipped into, for instance, a hot mixture of paraffin, carnauba wax and hydrolene, cooled, and cold-calendered. The foliate material may, alternatively, be applied to separate pulp webs which are then united in laminated formation.—A.P.-C.

Mineral-Filled Paper. The Mead Corporation. Brit. pat. 486,943 (June 8, 1938).—Mineral filler is added to the wire side of a wet paper-pulp web which is then partially dried and further mineral is added to either or both sides; the finished paper product is suitable for color-printing, etc. An apparatus is specified.—A.P.-C.

Paper. Donald K. Pattiloch. Can. pat. 376,347 (Sept. 6, 1938).—Fiber-water mixture containing negatively charged colloids and negatively charged cellulose fiber is flowed in contact with positive electrode plates having their lengthwise direction in the direction of flow, and the mixture maintained in contact with the plates long enough to allow the colloids to be attracted to the plates but insufficient to allow the cellulosic fibers to be attracted to the plates in any appreciable amount. An apparatus is described.—A.P.-C.

Wrapping Material for Food. Vegetable Parchment Mills (Delcroix) Ltd., and A. W. Pirie. Brit. pat. 490,349 (Jan. 17, 1938).—A basic sheet of comparatively dark-colored paper or cellulosic material (to stop visible and ultra-violet radiation) is faced on one or both sides with vegetable parchment, water-repellent adhesive (wax) being used.—A.P.-C.

Insulating Panel. J. E. Aubanel and G. H. Alabaster. Brit. pat. 474,150.—Superimposed sheets of thin creped paper of open gauzy texture, preferably fireproofed, enclosed in a waterproofing covering, is used as an insulating panel. Interposed sheets of stiffer corrugated material such as cardboard may be used to prevent displacement of the packing. A suitable fireproofing solution comprises ammonium sulphate. boric acid and borax.—A.P.-C.

Fibrous Boards. H. Basler. Brit. pat. 471,460.—In the preparation of insulating, sized fiber boards from waste obtained during the web working-up of sisal agave to hemp fibers, the long fibers are separated from the sisal agave leaving plant juice and a solid residue. The latter is treated to yield fibrous pulp to which is added the plant juice and the mixture is formed into boards and dried. The boards are insulators of heat and sound, and are resistant to decay and to termites. In an example, fibers are loosened from crushed leaves from which the plant juices have been collected. The solid residue is boiled, e.g., under pressure for 2 to 3 hrs. with approximately 10 per cent of the plant juice, and the pulp is treated in a Hollander, cast into plates and dried. Pressure may be applied to the plates while moist. Artificial resins or the like may be added to the pulp during beating.—A.P.-C.

Coating Paper Containers. Georges Lacour. Brit. pat. 484,990 (May 9, 1938).—Latex to which at least one tanning agent, e.g., tannin, gallic or pyrogallic acid or catechol, has been added, is used. Odor is thereby eliminated, a better adherence of the latex is obtained and also greater mechanical strength.—A.P.-C.

Contributions to the Chemistry of the Plant Cell Wall

IX. Further Studies on the Location of Lignin, Cellulose, and Other Components in Woody Cell Walls

By W. M. Harlow[1]

Abstract

In general, three methods of attack have been used by workers in cell-wall chemistry: (1) color reactions to so-called microchemical stains (including aniline dyes); (2) the use of polarized light, and (3) differential solubility in various reagents used in quantitative wood analysis. The first of these methods has been discarded by most modern investigators, since the results, with few exceptions, seem to have little chemical significance. The second, although a useful tool, is quite limited in its application, and, therefore, the trend seems to be strongly in the direction of the third method, observations on the effect of various solvents applied to cell walls.

Before presenting the results of certain experiments in this field, it may be worthwhile to suggest that the cell-wall microchemist can hardly advance beyond the point where the action of his solvents is known to workers in the chemistry of wood or other tissues. The advances in cell-wall chemistry of the last decade have been due largely to the fact that the reagents used were already well known and their effect upon wood had been studied qualitatively and quantitatively by a very large number of investigators. However, it must be realized that terms such as *lignin, hemicellulose, polyuronides,* and to a lesser extent even *cellulose* are used merely for convenience in describing certain residues obtained by specific arbitrary treatments of plant tissues. The first three groups of "substances" have been shown to be more or less related to each other through intermediate forms *(13)*. This often makes their separation by differential solubilities a procedure of questionable significance. Furthermore, that their chemical nature is not well understood is indicated among others by Norman *(13)*, who begins his chapter on the polyuronide hemicelluloses, with the statement: "The chemistry of the hemicelluloses remains to be written. Their structural complexity and physical properties make examination difficult, their isolation is beset with pitfalls, and their separation and purification with uncertainty."

It is not surprising, therefore, to find that such reagents as dilute mineral acids and alkalis in hot aqueous solution remove some of the lignin, the hemicelluloses, and polyuronides. Kerr and Bailey *(12)* found that a hot sodium sulphite solution removed polyuronides, and, therefore, substituted for it 10 per cent ammonia after chlorination, in the attempt to remove all the lignin without attacking the polyuronides. But Anderson *(1)* found that slightly more polyuronides could be removed after chlorination than before (extraction of pretreated chlorinated powdered wood with hot alcohol), and previous to chlorination, he partialy removed these substances by hot dilute HCl, followed by weak ammonium hydroxide. It seems at least possible that chlorination, followed by dilute ammonia, might remove not only lignin but also some of the polyuronides.[2]

These considerations indicate that the cell-wall chemist must use discretion in the interpretation of his results. Describing the effects of various reagents on the layers of the cell wall, and the correlation of this information with the latest concepts of plant chemistry as they become available appears to be his chief function. This is an important field as may be seen from such studies as that of Bixler *(5)* on the effect of commercial pulping liquors on thin sections of wood.

In 1925, Ritter *(14)* demonstrated that, contrary to prevailing opinion, the bulk of the lignin in wood is located in the "middle lamella" or central layer of the cell wall. He endeavored to show the presence of pectin (polyuronides) in thin sections of wood by treating them with appropriate solvents, but did not observe any tendency of the cells to separate from each other, which might be expected if the middle lamella were composed chiefly of these substances. Harlow *(9)* substantiated these findings, showing, also, that there was a difference in the behavior of the secondary walls of conifers, and temperate climate broad-leaved trees, respectively, in their reaction to 72 per cent H_2SO_4 *(10)*. Acid treated secondary tracheid walls of conifers gave a coherent structural residue, while tracheid, or fiber-tracheid walls in the broad leaves, *dicotyledons,* disintegrated completely. Upon standing, both preparations showed a fine amorphous precipitate which might be interpreted as carbonized polysaccharides *(15)*, or especially in the hardwoods, also cell-wall lignin, because when small blocks of these were treated with acid, and subsequently sectioned in paraffin, a coherent but very tenuous structural residue could be obtained. It was shown later *(11)* that these differences between conifers and hardwoods had a direct correlation with the comparative ease of making lignin determinations in the two groups, respectively, and served further to indicate the value of such studies in interpreting purely quantitative data.

Kerr and Bailey *(12)* have recently made a series of studies on the cell wall, and have shown that in mature wood the "middle lamella" as recognized by the above writers appears to consist of three layers, viz: the true middle lamella or intercellular substance, and a primary wall contiguous on either side. They also reject the term "tertiary" in speaking of the innermost layer of the secondary wall. These items

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[2] Correspondence with Dr. A. G. Norman indicates that polyuronides are attacked by this treatment.

are mentioned, since their terminology is used to promote a better understanding among workers in this field.

Experimental Part

A further study has been made of the effect of Schweizer's reagent, 72 per cent H_2SO_4, hemicellulose solvents, and polyuronide solvents, upon sections of wood progressively delignified, both with chlorine water followed by 10 per cent NH_4OH, and also with monoethanolamine *(16)*. Dry sapwood, Table I, of the following species was aspirated in cold water and sectioned. The sections (10 μ in thickness) were then stored in 15 per cent alcohol, pending use. A larger number of conifers was sampled because in them the secondary-wall lignin is more resistant, and in untreated sections gives coherent residues in 72 per cent H_2SO_4.

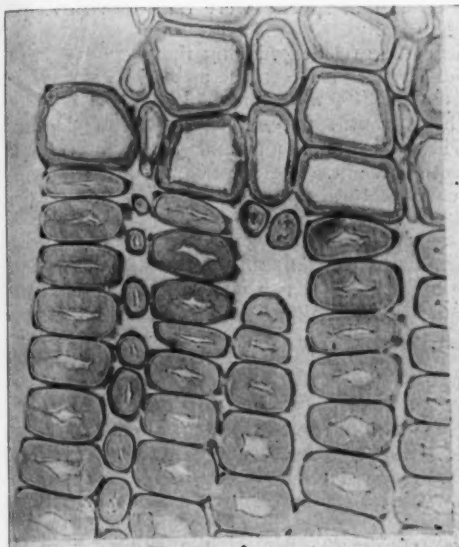

FIG. 1

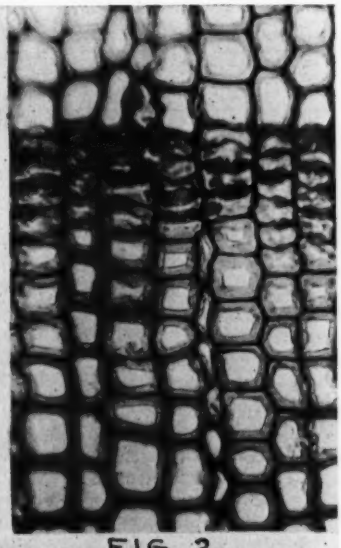

FIG. 2

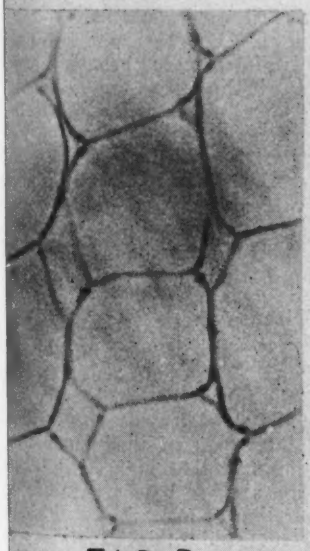

FIG. 3

FIG. 4

FIGS. 1, 2, 3 AND 4.

FIG. 1. Red spruce wood; transverse section delignfied with chlorine water and 10 per cent ammonia, × 400. (Section is completely soluble in 72 per cent H_2SO_4 and Schweizer's reagent). FIG. 2. Engelmann spruce, transverse section in Schweizer's reagent, after one chlorination and treatment with ammonia, × 150. (Secondary walls in similar sections are completely soluble in 72 per cent H_2SO_4). FIG. 3. Engelmann spruce, transverse section showing primary wall network, × 800. (Section immersed in Schweizer's reagent). FIG. 4. Red pine lignin (*Pinus Resinosa*); transverse section of a summerwood tracheid × 1800. (Section from a small block embedded in paraffin).

Kerr and Bailey *(12)* state that wood sections of certain dicotyledons, delignified to the point where they are completely soluble in 72 per cent H_2SO_4, do not macerate, but that upon treatment with polyuronide solvents, maceration takes place. They conclude, therefore, that the middle lamella contains both lignin and polyuronides.

Fig. 1 shows a section of red spruce wood given six 5-min. chlorinations (saturated chlorine water), followed each time by treatment in 10 per cent NH_4OH with intermediate washing. The residue was completely soluble both in 72 per cent H_2SO_4, and in Schweizer's reagent. Even though the intercellular substance seems to have been removed, it is true that such sections do not "macerate," if by this term is meant a complete separation of each cell from those touching it. However, the slightest agitation serves to set the cells free, and it is difficult to prevent the section from breaking up into smaller pieces.

Sections of white pine, eastern red cedar, Engelmann spruce, bigtree, chestnut, tupelo and cottonwood, delignified in the above manner, and, also, with ethanolamine, were heated on a water bath for from 1-2 hours in 5 per cent aqueous ammonium oxalate (also in 0.5 per cent of the same reagent). In no case was there any visual evidence of further chemical change, and actual maceration did not result. This agrees with Bixler's work *(5)* in which he found that sections delignified in commercial pulping liquors

TABLE I—DRY SAPWOOD ASPIRATED IN COLD WATER AND SECTIONED

Conifers	Species Sampled
Eastern white pine	*Pinus strobus* L.
Western white pine	*Pinus monticola* Doug.
Lodgepole pine	*Pinus contorta* Loud.
Engelmann spruce	*Picea engelmanni* (Parry) Engelm.
Red spruce	*Picea rubra* Link.
Sitka spruce	*Picea sitchensis* (Bong.) Carr.
White fir	*Abies concolor* Lind. and Gord.
Eastern red cedar	*Juniperus virginiana* L.
Northern white cedar	*Thuja occidentalis* L.
Southern white cedar	*Chamaecyparis thyoides* (L.) B.S.P.
Bigtree	*Sequoia washingtoniana* (Winsl) Sudw.
Kauri pine	*Agathis australis* Salisb.
Kahikatea	*Podocarpus dacrydioides* A. Rich.
Broad Leaved Trees	
Chestnut	*Castanea dentata* (Marsh.) Borkh.
Cottonwood	*Populus deltoides* Marsh.
Tupelo	*Nyssa aquatica* L.
Red alder	*Alnus rubra* Bong.

did not macerate in hemicellulose or polyuronide solvents. Maceration could be accomplished only by subjecting them to Schweizer's reagent or to 72 per cent H_2SO_4. In this case the cells rapidly swelled, separated cleanly, and dissolved completely. These results have been substantiated in the present study.

Cohen *(8)* has suggested that secondary cell wall lignin may be hemicellulose which in conc. H_2SO_4 gives insoluble structural images. To test this possibility, sections of white pine, red spruce, northern white cedar, Kauri pine and white fir were pretreated for 1 hr. on a water bath with 0.5 per cent NaOH (aq.) followed by 3 hr. in gently boiling 3 per cent H_2SO_4. When tested with 72 per cent H_2SO_4, no difference could be detected between the residues produced, respectively, from treated and untreated material. If it can be assumed that the pretreatment removed the hemicellulose, it seems probable that secondary cell-wall lignin does "exist". In any event, its progressive removal can be followed in sections treated for varying lengths of time with ethanolamine, or chlorine water and ammonia, followed by 72 per cent H_2SO_4 *(10)*. However, the matter is further complicated by Cohen and Harris' recent work *(7)*, indicating that pretreatment of wood with dilute acids or alkalis not only removes the hemicelluloses but, also, measurable amounts of lignin. In the present experiments, apparently, not enough of the latter was removed from the secondary wall to affect the resulting acid resistant residues from this layer.

In delignifying wood, failure to respond to the Maüle color reaction and the concomitant complete solubility of the residue in 72 per cent H_2SO_4 have been taken as the end-point in preparing cellulose. Some workers, also, specify solubility in Schweizer's reagent. This study shows that sections, delignified to the point where they just become completely soluble in 72 per cent H_2SO_4, are not entirely soluble in Schweizer's reagent. This was indicated by Kerr and Bailey *(12)*, who in this manner demonstrated the presence of a primary wall in delignified sections subsequently immersed in cuprammonia. They stated that such delignified material when treated first with polyuronide solvents and then Schweizer's reagent, completely dissolved. From this they concluded that pectins were present in the primary wall.

This was partly substantiated in the present study. Sections of white pine and Engelmann spruce were delignified to the point where the residues were soluble in 72 per cent H_2SO_4, but produced a primary-wall net in cuprammonia. Similar delignified sections were cooked in 0.5 per cent aqueous ammonium oxalate for 2 hr., and, then, immersed in Schweizer's reagent. Nearly complete solubility resulted, but in bigtree and several other species, sections treated in this manner still gave a broken primary network. However, if delignification with ethanolamine, or chlorine water was continued, or the section cooked in dilute NaOH, the residue was then quickly and completely soluble in Schweizer's reagent. Presumably, then, the resistant material in the primary wall may be lignin in mixture with small amounts of polyuronides. In this connection a primary-wall net was, also, obtained when partially delignified sections of certain species were treated with 72 per cent H_2SO_4.

In the course of delignifying the secondary wall, similar differences between the action of Schweizer's reagent and H_2SO_4 were noted. Fig. 2 shows a section of Engelmann spruce, given one 5-min. chlorination, followed by ammonia, and, then, immersed in Schweizer's reagent. The secondary wall still shows a coherent structural pattern. The walls in a portion of the same section, treated with 72 per cent H_2SO_4, dissolved completely. However, after further delignification, these walls dissolved quickly in cuprammonium hydroxide. It is a general observation, with no exceptions noted, that Schweizer's reagent always gives coherent cell-wall residues at the point in delignification where similar material is completely soluble in 72 per cent H_2SO_4.

Bailey and Kerr *(4)* in their work on the secondary wall state: "Where walls exhibit an intense coloration with the Maüle test, but disintegrate upon treatment with 72 per cent H_2SO_4, it is possible to obtain coherent structural residues by first soaking the sections in a solution of vanillin." This would seem of considerable interest because of the similarity in the constitution of vanillin and coniferyl aldehyde; the latter is considered by some workers to be a possible "building stone" of lignin *(2)*.

Sections of cottonwood, tupelo, red alder and chestnut were immersed in a 20 per cent (saturated) alcoholic solution of vanillin for 1 week. They were washed quickly in distilled water, and subsequently treated with 72 per cent H_2SO_4. These, and untreated sections showed no difference in behavior (see acknowledgement). In both cases, the secondary walls of the tracheids and fiber-tracheids, swelled and disintegrated completely. All of these woods gave a good Maüle color test when chlorinated and treated with ammonia. They may, however, belong to a class of species which Bailey and Kerr found incapable of giving structural residues, even when treated with vanillin. This subject should be studied further because of its possible relation to lignification.

Discussion

Kerr and Bailey's *(12)* show a "delignified" section after treatment with Schweizer's reagent. The legend reads in part "the intercellular substance and secondary walls have dissolved leaving the cambial walls only". Careful inspection of this illustration, however, brings out the fact that in several places the primary walls do not seem to have separated. In fact, if they had, maceration of necessity would have resulted. In the present study this situation was confirmed and observed many times Fig. 3, but with certain species a continuous primary wall net did

[3] Since sections only 10 μ thick are not actually macerated by delignification, it is understandable why pulp from a digestor still retains the general outline of the chips until "blown" under pressure against the target, or otherwise treated to break up the fiber masses. Maceration is, apparently dependent upon not only chemical ,but, also, mechanical treatment.

not occur. Instead, the cells separated, and detached primary rings drifted about in Schweizer's reagent. In the first instance it is suggested that during cell growth, the intercellular substance is squeezed so thin, especially on the tangential faces of the cells in the conifers that the primary walls make contact occasionally with each other. Then, when the true intercellular substance is removed in delignifiation, portions of the section barely cohere and the slightest agitation cases them to separate.[3] The section may then be likened to a loog boom in which a number of logs, here and there, are fastened together while the others float unattached. Such a section is clearly shown by Bailey *(3)*. It, therefore, does not seem necessary to assume as does Bixler *(5)* that some gelatinous substance is present, binding the cells together in completely delignified sections. The fact that such sections actually macerate only when treated with 72 per cent H_2SO_4, or Schweizer's reagent may be due only to the prodigious swelling which always precedes solution of the cell walls in these reagents.

Bailey *(3)* refers to gaps in the middle lamella of the summerwood of sulphite digested Douglas fir sections. If the researches of Kerr and Bailey *(12)* and of Bixler *(5)* are considered, a possible explanation can be offered. In the first place Bailey's Fig. 4 shows very plainly a 3-layered middle lamella of which only the central layer seems to be true intercellular substance. The remaining two layers appear to be primary walls, respectively. If, as Bixler has shown by swelling tests, and mechanically, the primary wall cannot be stretched appreciably without rupturing, then Bailey's "gaps" would seem to be due to the swelling of the secondary walls in the sulphite liquor. That the gaps were found only in the thick walled summerwood cells is significant, since, in a springwood cell, the secondary wall is much thinner, and moreover, the lumen is larger, permitting internal expansion. Incidentally, the writer has seen similar gaps in the primary walls of summerwood cells in several delignified coniferous woods. That these gaps are actual morphological "structures" present in untreated material seems questionable. Further evidence of the difference in character of the secondary wall and primary walls, respectively, is furnished in Fig. 4. Here a section of a lignin residue is shown, which was cut from a small block (2 mm. cube) that had been embedded in paraffin, following several hours treatment with 72 per cent H_2SO_4. The dense bar-like structure at the top is the "compound middle lamella" consisting of the true intercellular substance, together with the adjacent primary walls of the two contiguous cells. It is of interest to note that the more porous secondary wall has swollen greatly and apparently ruptured the "compound lamella" at several points, because of its inability to stretch.

The question as to whether solubility in 72 per cent H_2SO_4, or Schweizer's reagent, is the better test for complete delignification, should perhaps be answered. Since sections, delignified to the point where they are completely soluble in the former reagent, give a primary wall residue in Schweizer's reagent, it would appear that not all of the encrusting substances have been removed. Since further delignification renders such sections soluble in cuprammonium hydroxide, this reagent, apparently, is the more sensitive in detecting small amounts of residual lignin, as well as polyuronides in certain cases. However, in the latter case the writer is unaware of any work showing that lignin is unaffected by hot solutions of such polyuronide solvents as oxalic acid and ammonium oxalate. These reagents have been used largely in extracting polyuronides from soft tissues, where the question of their possible action on lignin was of no importance. Their use on woody tissues will perhaps have greater significance when quantitative data are available showing what effect they have, if any, on the residual lignin.

It is well to remember that a cell wall which appears to be completely soluble in 72 per cent H_2SO_4, and perhaps, also, in cuprammonium hydroxide, may actually contain some lignin or other encrusting substance. In such a case, the amount is so small that it is insufficient to preserve the structural continuity of the wall, which, therefore, collapses into particles often too small to be seen with the microscope.

Fiber Structure

The behavior of delignified and partially delignified fibers, swollen in cuprammonium hydroxide, has been studied by several workers including Carpenter and Lewis *(6)*, who cite a number of references on this subject. They found that "rawcooked" or incompletely digested fibers were, apparently, encased in a lignin sheath which prevented appreciable swelling in this reagent. Upon further cooking, however, the sheath was presumably removed, and in such fibers characteristic ballooning took place in cuprammonium hydroxide. The identity of this lignin sheath in terms of cell wall structure, as now understood, would seem to have both a practical and theoretical interest. Apparently the sheath must be (1) a part of the intercellular substance, the central portion of which has been removed by cooking, (2) the primary wall, or (3) the outer, somewhat heavily lignified layer of the secondary wall. Bixler *(5)* did not find evidence that the true intercellular substance showed cleavage of any sort, and this is, also, the conclusion of the writer. Bixler further stated that the primary walls are definitely a part of pulp fibers, and that "none of the commercial digesting liquors or bleaching agents remove them". Finally, he showed that fiber ballooning is related to the nature of the primary and secondary walls, respectively. The primary wall is relatively inelastic, the secondary wall considerably so, hence the phenomenon of ballooning. Now Bixler states that the primary wall is apparently not the same layer as Carpenter and Lewis' lignin sheath because in sections cooked for 1 hour in sulphate liquor, the primary wall was soluble in Schweizer's reagent and 72 per cent H_2SO_4, whereas the "lignin sheath" from raw-cooked fibers was insoluble in these reagents. It is at least permissible to question whether the treatments in these cases were comparable since apparently a different degree of delignification was attained. However, in spruce sections cooked for ½ hour in sulphite liquor, Bixler found that, apparently, the primary walls dissolved in 72 per cent H_2SO_4, while the intercellular substance did not. This strengthens his claim that the primary wall and lignin sheath are not one and the same. As shown in the present paper, when sections are delignified with chlorine water and ammonia, the lignin in the intercellular substance is mostly removed before being extracted completely from the primary walls. Apparently, pulping liquors do not produce results entirely comparable to this method of delignification. Although the primary wall

as laid down in the cambial region is composed of cellulose with various amounts of polyuronides, it is very heavily lignified in mature tissues. It, therefore, seems reasonable that undercooked fibers should be enclosed in a lignin sheath, but that, upon complete delignification, this same layer (primary wall?) would be soluble in the cellulose solvents. Carpenter and Lewis state, that their lignin sheath is actually removed by further cooking, but their photomicrographs do not necessarily bear out this contention, since the fragments shown on the balloon surfaces could, also, be remnants of the primary wall.

These workers show the appearance of the lignin sheath from a raw-cooked aspen fiber treated with 72 per cent H_2SO_4. This, perhaps, offers the best evidence that the layer in question is the primary wall, since untreated secondary walls in sections of aspen disintegrate completely when subjected to this reagent. However, in their illustration of the lignin sheath from spruce, pits are in evidence, and, since, these are features of the secondary wall, it is suggested that in this case the wall has not been delignified past the point where it will give an insoluble residue with 72 per cent H_2SO_4. The greater resistance to delignification of secondary cell-wall lignin in the conifers has already been demonstrated *(10)*. The fact that the lignin sheath has a more or less definite structure would indicate that it is not intercellular substance. Finally, if Bixler is correct that ballooning is due to the nature of the primary wall which is always present on the cooked fiber, then the lignin sheath must be either exterior to it (a portion of the intercellular substance, which seems improbable) or the modified primary wall itself. Further investigation is necessary before a definite statement can be made concerning this matter.

Summary

Wood sections delignified by standard methods do not macerate in the sense that each cell separates from those touching it, even though the intercellular material is, apparently, all removed.

The slightest agitation of such immersed delignified sections is sufficient to cause their dissociation into large or small cell aggregates depending upon the species in question.

Treatment of delignified sections with solvents for polyuronides and hemicelluloses had no further macerating action on the woods studied.

In delignifying wood, the layer, most retentive of lignin, seems to be the primary wall. This is shown by its presence as a network in 72 per cent H_2SO_4 (and at a later stage in Schweizer's reagent), after the intercellular substance has been removed, and when the secondary walls are completely soluble in these reagents.

Primary walls may be delignified to a point where they are completely soluble in 72 per cent H_2SO_4, but are insoluble in Schweizer's reagent. They may, then, be made soluble in the latter reagent by further delignification, treatment with "hemicellulose" solvents, or, in some cases, by treatments with solvents or polyuronides.

Secondary walls, delignified to the point where they are soluble in 72 per cent H_2SO_4, but insoluble in Schweizer's reagent, may be rendered soluble in the latteer reagent by further delignification.

Solubility of cell walls in Schweizer's reagent is, probably, a better test for the complete removal of "encrusting substances" (particularly lignin) than is solubility in 72 per cent H_2SO_4.

Treatment of wood sections of several dicotyledons with vanillin failed to cause the secondary wall of fiber tracheids to give a coherent structural pattern when subjected to 72 per cent H_2SO_4, even though untreated sections gave a strong Maüle color test.

Acknowledgements

The writer is indebted to W. Frank Fowler for repeating the alcoholic solution of vanillin experiments on yellow poplar, slippery elm, American elm, red gum and hackberry. Even when immersed in acid without first washing in water (excess vanillin solution removed with blotting paper), no difference could be noted as between treated and untreated sections.

The writer is, also, indebted to Drs. H. P. Brown, L. E. Wise and E. C. Jahn for reading the manuscript.

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James D. Griffin Goes To Glens Falls

[FROM OUR REGULAR CORRESPONDENT]

GLENS FALLS, N. Y., October 30, 1939—Expansion plans under way at the Union Bag and Paper Company have resulted in the transfer of James D. Griffin from New York City to this place where he will maintain his offices. Mr. Griffin, manager of the Scutan division, has been associated with the building industry for many years. He is a graduate of St. Lawrence University and also held a commission in the navy during the World War. It is expected that the change will permit better coordination of the offices of general management and sales with plant management, production and research at the mills managed by Donald B. Wheeler, of this village. Ground was broken recently at Fenimore for the construction of a new addition to the plant which will cost about $83,000. The building will be two stories in height, covering 100 by 125 feet, and will contain converting equipment for processing of paper which will about double the division's present tonnage. Many additional persons will be given employment with the completion of the structure. Scutan, a well recognized brand in the protective packaging field, operates some of the most technical equipment in the waterproof paper field. It maintains its own staff of technical men for research in its own laboratories.

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Filter pulp .....200 bls.
Surface coated paper.....243 cs.
Basic paper .....131 cs.
Decalcomanias .....71 cs.
Transfer paper .....20 cs.
Photo paper .....4 cs.
Surface baryta coated paper.....18 cs.
Transparent paper.....10 cs.
Miscellaneous paper ..... 207 bls., 4,386 rolls

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Parsons & Whittemore, Inc., *Drottningholm,* Gothenburg, 81 rolls.
Perkins Goodwin & Co., *Drottningholm,* Gothenburg, 191 rolls.
International Paper Co., *G.T.D.,* Gatineau, 305 rolls.
H. G. Craig Co., Inc., *A.C.D.,* Donnacona, 357 rolls.
International Paper Co., *International #1,* Gatineau, 283 rolls.
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Brooklyn Standard Bag Corp., *Bjorneborg,* Mantyluoto, 125 lbs.

FILTER PAPER

E. H. Sargent Co., *Drottningholm,* Gothenburg, 29 cs.

FILTER PULP

International F'd'g Co., *Rotterdam,* Rotterdam, 200 bls.

SURFACE COATED PAPER

General Motors Overseas Operations, *Bilderdyk,* Rotterdam, 124 cs.
Gevaert Co. of America, *Black Hawk,* Antwerp, 119 cs.

BASIC PAPER

General Motors Overseas Operations, *Bilderdyk,* Rotterdam, 116 cs.
Dingelstedt & Co., *Bilderdyk,* Antwerp, 15 cs.

DECALCOMANIAS

General Motors Overseas Operations, *Rotterdam,* Rotterdam, 71 cs.

TRANSFER PAPER

Fuchs & Lang Manfg. Co., *Bilderdyk,* Rotterdam, 20 cs.

PHOTO PAPER

Heemsoth Kerner Corp., *Rotterdam,* Rotterdam, 4 cs.

SURFACE BARYTA COATED PAPER

Dingelstedt & Co., *Bilderdyk,* Rotterdam, 18 cs.

TRANSPARENT PAPER

M. J. Corbett & Co., *Bilderdyk,* Rotterdam, 10 cs.

MISCELLANEOUS PAPER

The Borregaard Co., Inc., *Drottningholm,* Gothenburg, 44 bls.
F. L. Kramer & Co., *Drottningholm,* Gothenburg, 129 bls.
National Pulp & Paper Co., *Drottningholm,* Gothenburg, 34 bls., 3,183 rolls.
Atlantic Freighting Corp., *Drottningholm,* Gothenburg, 1,203 rolls.

RAGS, BAGGINGS, ETC.

———, *Oriente,* Havana, 46 bls. rags.
D. S. Stern Corp., *Bidevind,* Bombay, 250 bls. cotton waste.
Irving Trust Co., *Bidevind,* Bombay, 262 bls. rags.
———, *City of Wellington,* Calcutta, 73 bls. rags.
Guaranty Trust Co., *Black Hawk,* Rotterdam, 15 bls. rayon waste.
W. J. Green, *Black Hawk,* Rotterdam, 442 bls. flax waste.
D. M. Hicks, Inc., *Black Hawk,* Rotterdam, 730 bls. flax waste.
Guaranty Trust Co., *Black Hawk,* Rotterdam, 251 bls. rayon waste.
J. K. Stewart, *Black Hawk,* Rotterdam, 113 bls. rayon waste.

OLD ROPE

Continental Bank Trust Co., *Bilderdyk,* Rotterdam, 64 coils.

CASEIN

Tupman Thurlow & Co., *Mormacmar,* Buenos Aires, 417 bags.
Cheese Importing Co., *Rotterdam,* Rotterdam, 800 bags.
Tupman Thurlow & Co., *Western Prince,* Buenos Aires, 834 bags.
Cheese Importing Co., *Bilderdyk,* Rotterdam, 400 bags.

WOOD PULP

Chase National Bank, *Idefjord,* Oslo, 870 bls. dry bleached sulphite, 145 tons.
The Borregaard Co., Inc., *Idefjord,* Greaker, 150 bls. dry bleached sulphite, 25 tons.
Chase National Bank, *Idefjord,* Tofte, 2,610 bls. dry bleached sulphite, 441 tons.
The Borregaard Co., Inc., *Idefjord,* Skien, 1,500 bls. dry unbleached sulphite, 254 tons.
Perkins Goodwin & Co., *Drottningholm,* Gothenburg, 140 bls. sulphate.
Castle & Overton, Inc., *Drottningholm,* Gothenburg, 1,496 bls. kraft sulphate.
Pulp Sales Corp., *Mosdale,* Kotka, 876 bls. dry mechanically ground pulp, 175 tons.
M. Sone, *Astra Riga,* 2,452 bls. wood pulp.

WOOD PULP BOARDS

H. Fuchs & Son, *Drottningholm,* Gothenburg, 115 crates.
Jay Madden Corp., *Mosdale,* Kotka, 1,516 rolls, 646 bls.

ALBANY IMPORTS

WEEK ENDING OCTOBER 28, 1939

Atterbury Bros., Inc., *Idefjord,* Drammen, 1,750 bls. dry wood pulp, 354 tons.
Atterbury Bros., Inc., *Idefjord,* Drammen, 250 bls. dry chemical pulp, 50 tons.
The Borregaard Co., Inc., *Idefjord,* Hurum, 1,350 bls. unbleached sulphate, 228 tons.
The Borregaard Co., Inc., *Idefjord,* Greaker, 1,800 bls. bleached sulphite, 304 tons; 1,050 bls. dry sulphite, 177 tons.
Price & Pierce, Ltd., *Idefjord,* Greaker, 1,375 bls. dry sulphite, 279 tons.
Parsons & Whittemore, Inc., *Simla,* ———, 750 bls. wood pulp.

Price & Pierce, Ltd., *Simla,* ———, 2,375 bls. bleached sulphite.
Price & Pierce, Ltd., *Gunda,* ———, 2,100 bls. unbleached sulphite.

PORTLAND IMPORTS

WEEK ENDING OCTOBER 28, 1939

M. Sone, *Lagaholm,* Gothenburg, 275 bls. wood pulp.
Price & Pierce, Ltd., *Yngaren,* ———, 1,272 bls. unbleached sulphite, 1,500 bls. unbleached sulphate.

BOSTON IMPORTS

WEEK ENDING OCTOBER 28, 1939

Elliott Addressing Machine Co., *Kongo Maru,* Yokohama, 12 cs. paper.
Parsons & Whittemore, Inc., *Simla,* ———, 500 bls. wood pulp.

PHILADELPHIA IMPORTS

WEEK ENDING OCTOBER 28, 1939

Jay Madden Corp., *Mosdale,* Kotka, 3,009 rolls 815 bls. wood pulp boards.

BALTIMORE IMPORTS

WEEK ENDING OCTOBER 28, 1939

Jay Madden Corp., *Bjorneborg,* Kotka, 980 rolls newsprint.
Pulp Sales Corp., *Bjorneborg,* Rauma, 3,896 bls. sulphite.
Pagel Horton & Co., Inc., *Arosa,* Sweden, 25,343 bls. wood pulp.
Pagel Horton & Co., Inc., *Trione,* Sweden, 5,000 bls. wood pulp.
Price & Pierce, Ltd., *Svaneholm,* ———, 15,000 bls. unbleached sulphate.
Price & Pierce, Ltd., *Arosa,* Sweden, 6,000 bls. unbleached sulphite.
Parsons & Whittemore, Inc., *Astra,* ———, 1,750 bls. wood pulp.
Parsons & Whittemore, Inc., *Sunda,* ———, 525 bls. wood pulp.
M. Sone, *Kuurtanei,* Stugsund, 14,878 bls. wood pulp.
M. Sone, *Nagara,* Gothenburg, 1,650 bls. wood pulp.

NEWPORT NEWS IMPORTS

WEEK ENDING OCTOBER 28, 1939

Price & Pierce, Ltd., *Hallfried,* ———, 2,100 bls. unbleached sulphate, 3,900 bls. unbleached sulphite, 2,400 bls. bleached sulphate.

LOS ANGELES IMPORTS

WEEK ENDING OCTOBER 28, 1939

———, *J. Lawrence,* Ocean Falls, 2,513 rolls newsprint.
———, *Kingsley,* Powell River, 66 pkgs. paperstock, 1,471 rolls newsprint.
———, *Pr. Coolidge,* Kobe, 5 cs. paper.
———, *Kamagura,* Maru Osaka, 3 cs. tissue paper, 2 cs. rice paper.
———, *Tai Ping Yang,* Yokohama, 6 cs. paper.
———, *El Capitan,* Ocean Falls, 2,055 rolls newsprint.

MONTREAL IMPORTS

WEEK ENDING OCTOBER 28, 1939

Pagel Horton & Co., Inc., *Mauritz* Sweden, 9,000 bls. wood pulp.

Tileston & Hollingsworth Have Display

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., October 30, 1939—Tileston & Hollingsworth, makers of paper for more than 135 years, had a display at the Boston Herald Book Fair, held in Boston Garden October 25-28, demonstrating the making of paper of Old Fashioned Quality, the way it was done when the company first started operation in 1801. The watermark was shown in the paper. Books made of paper produced at the plant of the company were on display. The display was under the supervision of A. V. Howland, assistant treasurer of the company.

Philadelphia Market Steady

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., October 30, 1939—In consequence of the confusion in the unpredictable European situation the local paper trade has drifted into an indeterminable position which may be described as marking time. In view of the conflicting cross currents of the situation, caused by the outside market coming in and placing orders at top prices was experienced, and the Philadelphia market had two of the most active months in several years. In fact, it was pointed out today by one of the leading local merchants that many merchants are only now receiving shipments of paper which were ordered the early part of September. The mills hereabouts are all running on full schedule, and while there is more or less of a change in market psychology it has not produced any jittery condition. The mills do not want to buy unless they can buy at their price, on the other hand the dealers will not sell unless they get their price. This may bring about a readjustment of prices with, however, no impairment of the recuperative market because it is a foregone conclusion that before long the mills will be obliged to come into the market and therefore prices are likely to be maintained.

In the waste paper industry it would be no exaggeration to state that the merchants have never been so puzzled over trends of prices and immediate market possibilities as they are at present.

C. S. Patton Made Sales Manager

Effective October 18, 1939, C. S. Patton was appointed sales manager of the Alco Products Division of the American Locomotive Company in charge of the sale of heat exchangers, condensers, feed water heaters, evaporators, tubular equipment, code pressure vessels, fabricated plate work, water pipe and allied lines.

Mr. Patton graduated from Cornell with the degree of Mechanical Engineer in 1918. For the following eight years he was connected with the ship building industry in various capacities with the Manitowoc Ship Building Company of Wisconsin, the U. S. Shipping Board, and the Staten Island Ship Building Company. In 1926 he accepted the position of New York manager for the Biggs Boiler Works Company, of Akron, Ohio. In 1929 he took charge of the sales of fabricated plate work for the Heat Transfer Products Company, which position he held after the Heat Transfer Products Company, was acquired by the American Locomotive Company and later expanded into Alco Products Inc. Later he was made manager of equipment sales, Alco Products Division of American Locomotive Company, which position he has held up to his present appointment.

Ohio Section to Discuss Dyeing

The Ohio Section of the Technical Association of the Pulp and Paper Industry will hold a dinner meeting Thursday evening, November 16, 1939 at the Hotel Manchester, Middletown, Ohio. F. A. Soderberg, of the General Dyestuff Corporation will speak on "Variables in Paper Dyeing." A general discussion of color problems will follow.

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, November 1, 1939

A more normal condition of activity, with rising consumer demand and some delay in mill shipments, is reflected in the reports received from many leading manufacturers' representatives, jobbers, and general paper merchants during the current week.

The index of general business activity advanced to 103.8 per cent for the week ended October 21, from 103.2 per cent for the previous week, compared with 87.8 per cent for the corresponding week in 1938.

Production of 194 paper mills for the week ended October 21 was estimated at 98.0 per cent, compared with 83.8 per cent for the corresponding period in 1938, and with 71.7 per cent in 1937. Paper board production was 84.0 per cent for the week ended October 21, compared with 70.0 per cent for the like period in 1938, and with 64.0 per cent for the corresponding period in 1937.

The forecasts of some recession or setback in the current rate of industry and trade late this year are, presumably, based in part upon the fact that production has considerably exceeded consumption. This has usually occurred in any upswing and providing prices do not rise so fast as to check demand, consumption may be expected to improve steadily and eventually strike a fair balance with production. This appears to be the more intelligent opinion on the current business prospect.

It has been pointed out that a very favorable factor in the present state of business is the high level of durable goods producion. According to the Federal Reserve Board index, the movement was up to 93 in August, from the low point of 71 last May. In August, 1938, this index figure was 64. It may also be pointed out that the upswing of business activity, based entirely upon favorable domestic factors, had made a substantial gain before events in Europe introduced the speculative element and accelerated the upward movement in industry and trade. This improvement is expected by many business leaders and economists to continue even if hostilities abroad fails to contribute the substantial volume of business expected by some American business men.

No important change in the newsprint market has been reported this week. Production of domestic mills continues at capacity and the output of Canadian mills is somewhat higher. Consumption of newsprint continues to increase rather slowly. Prices are unchanged at prevailing market quotations.

Sales volume in the New York market of all grades of paper continues at a good level and an encouraging increase in consumer demand is indicated in the reports from the trade. No further advances in resale prices from the new level reported last week have occurred to date. In reference to prices it may be pointed out that in view of the low price level which had prevailed for sometime before any price advances had been made, the recent upward readjustment in the market of quotations on nearly all grades of paper has been moderate and viewed in the trade as fully warranted by the normal adjustment effected by supply and demand.

Mechanical Pulp

No important change in the mechanical pulp market has been reported this week. Prices are firm under an active demand, with no changes reported.

Chemical Pulp

No important change in demand or prices in any grade of chemical pulp has been reported this week. Good grades of unbleached sulphite are reported as still rather scarce, with all other grades of domestic and imported pulp in ample supply.

Old Rope and Bagging

No important change in the old rope market has been reported this week. Prices remain firm and trading in old bagging is rather slow.

Rags

The rag market continues steady with prices firm and unchanged in all grades of new and old domestic rags, including the roofing grades. Export business is quiet this week with some important exporting firms reported out of this market.

Old Waste Paper

No important change in the paper stock market has been reported this week to date. Prices are unchanged and a little less firm in some grades, with old corrugated in active demand.

Twine

No important change has been reported in the twine market this week. Prices continue firm and conform to prevailing market quotations.

To Reopen Idle Delaware Mill

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., October 30, 1939—Reopening of a section of the Augustine Mills paper container plant in Wilmington, which will employ about 50 men, was announced today.

The Augustine Mills were bought by the Container Corporation of America from the Delaware Paper Mills, Inc. At first the plant will be operated at only about 50 per cent of capacity, but it is expected the operations will be expanded in the immediate future.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, November 1, 1939.

BLANC FIXE—Prices on blanc fixe are firm under a good demand and unchanged at prevailing market levels. The pulp is currently offered at from $42.50 to $45 per ton, in bulk; the powder is quoted at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER—Quotations on bleaching powder are firm under an active demand and unchanged at prevailing market levels. Bleaching powder is currently quoted at from $2 to $2.85 per 100 pounds, in drums, at works.

CASEIN—Quotations on casein are firm under a good demand and conform to prevailing market prices. Standard domestic casein, 20-30 mesh, is currently quoted at 20 cents per pound; 80-100 mesh, at 20½ cents per pound; all prices in bags, car lot quantities. Quotations on imported casein are nominal.

CAUSTIC SODA—Quotations on caustic soda are firm under a good demand. Contracts are being renewed at prevailing market prices. Solid caustic soda is currently quoted at from $2.30 to $2.40 per 100 pounds; flake and ground at from $2.70 to $2.95 per 100 pounds, in drums, at works.

CHINA CLAY—Prices on china clay are firm under a good demand. Prices continue unchanged at prevailing market levels. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is quoted at from $13 to $25 per ton, ship side.

CHLORINE—Quotations on chlorine are firm. New contracts are being written at prevailing market prices. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported as firm. Prices for the week are a little higher. "G" gum rosin is currently quoted at $5.50 per 280 pounds, gross weight, in barrels, at Savannah. "FF" wood rosin is offered at $5.20 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is quoted at $2.90 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Prices on salt cake are firm under an active demand, with prices unchanged. Current quotations on salt cake range at from $15 to $19 per ton; chrome salt cake at from $14 to $15 per ton, f.o.b., shipping point. Prices on imported salt cake are nominal.

SODA ASH—Quotations on soda ash are firm under a good demand. New contracts are being written at prevailing market prices. Current quotations on soda ash in car lots, per 100 pounds, are as follows; in bulk, $.90; in bags, $1.10; and in barrels, $1.35.

STARCH—Quotations on corn starch are firm under a good demand. Globe pearl is currently quoted at $2.55 per 100 pounds; special paper starch at $2.65 per 100 pounds. All prices in bags, f.o.b., Chicago.

SULPHATE OF ALUMINA—Prices on sulphate of alumina are firm under an active demand. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at $1.30 per 100 pounds, in bags, car lot quantities, f.o.b., works.

SULPHUR—Quotations on sulphur are firm under a good demand and conform to prevailing market prices. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are offered at $19 per ton.

TALC—Prices on talc are firm under a good demand and unchanged at prevailing market quotations. Domestic talc is currently quoted at from $15 to $18 per ton, Eastern mines. Prices on imported talc are nominal.

Market Quotations

Paper

(Delivered New York)

News, per ton—

Roll, contract	$50.00	@	—
Sheets	58.00	@	—

Kraft—per cwt.—Delivered Zone 4

Northern, Extra Quality	$4.87½	@	$5.50
Superstandard	4.50	@	5.00
Northern Standard Wrapping	4.25	@	4.50
Standard Wrapping	4.00	@	—

Tissues—Per Ream—Carlots

White No. 1	.87½	@	—
White No. 1 M. G.	.85	@	—
White No. 1½	.62½	@	—
White No. 2	.65	@	—
Anti-Tarnish M. G.	.75	@	—
Colored	.87½	@	—
Kraft	.75	@	—
Manila	.65	@	—
Unbl. Toilet, 1 M.	3.35	@	—
Bleached Toilet	5.26	@	—

Paper Towels, Per Case—

Unbleached, Jr.	1.85	@	—
Bleached, Jr.	3.20	@	—

Manila—per cwt.—C. l. f. a.

No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	@	—
No. 2 Manila Wrapping, 35 lb.	5.00	@	—

Boards, per ton—

News	45.00	@	—
Chip	45.00	@	—
Sgl. Mla. Lt. Chip	57.50	@	—
Jute Lined Chip	57.50	@	—
White Pat. Coated	70.00	@	—
Kraft Liners	55.00	@	—
Binders Boards	76.00	@	87.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items.

Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1.	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05@ 36.50	32.20@ 37.75
85% Rag	.....	29.90@ 35.00
75% Rag	23.60@ 27.75	24.75@ 29.00
65% Rag	.....	21.65@ 26.25
50% Rag	17.55@ 21.50	18.70@ 22.75
25% Rag	14.65@ 17.75	15.80@ 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items.

Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$8.95@$11.00	$10.10@$12.25
No. 2	8.05@ 9.75	9.25@ 11.25
No. 3	7.60@ 9.25	8.50@ 10.75
No. 4	7.30@ 9.00	8.50@ 10.25

Colors $1.00 cwt. extra

Free Sheet Book Papers—White, Cased Paper.

Delivered in Zone 1:

No. 1 Glossy Coated	$11.90	@	$13.50
No. 2 Glossy Coated	10.35	@	11.75
No. 3 Glossy Coated	9.55	@	11.00
No. 4 Glossy Coated	9.15	@	10.50
No. 1 Antique (watermarked)	8.35	@	9.50
No. 2 Offset	7.70	@	9.00
A Grade E. F.	7.50	@	8.75
A Grade S. & S. C.	7.75	@	9.00
B Grade E. F.	6.95	@	8.00
B Grade S. & S. C.	7.20	@	8.25
C Grade E. F.	6.65	@	7.75
C Grade S. & S. C.	6.90	@	8.00
D Grade E. F.	6.40	@	7.50
D Grade S. & S. C.	6.65	@	7.75

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—

Moist	30.00	@	35.00
Dry	30.00	@	35.00

(Delivered)

No. 1 Domestic and Canadian	38.00	@	40.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—

Prime Bleached Sulphite	2.50	@	3.00
Prime Qualities—Easy-Bleaching Sulphite	2.20	@	2.35
Strong Unbleached Sulphite	2.10	@	2.30

(On Dock, Atlantic Ports)

Kraft Bleached	2.75	@	3.25
Kraft Light & Strong	1.65	@	1.80
Kraft No. 1	1.60	@	1.75

(F. o. b. Pulp Mill)

Kraft Domestic	1.60	@	2.12½

(Delivered)

Soda Bleached	2.55	@	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits. Also add extra freight charges and war insurance to all quotations on imported pulp.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—

New White, No. 1	8.00	@	8.25
Silesias No. 1	5.25	@	5.50
New Unbleached	8.00	@	8.25
Blue Overall	5.50	@	5.75
Fancy	2.50	@	3.00
Washables	2.15	@	2.25
Mixed Khaki Cuttings	2.75	@	3.00
O. D. Khaki Cuttings	3.00	@	3.25

Old Rags

White, No. 1—

Repacked	3.50	@	4.00
Miscellaneous	3.00	@	3.25

White, No. 2—

Repacked	1.25	@	2.75
Miscellaneous	1.75	@	1.90

Thirds and Blues—

Repacked	2.00	@	2.25
Miscellaneous	1.75	@	1.90

Roofing Rags—

No. 1	1.70	@	1.80
No. 2	1.35	@	1.40
No. 3 (bagging)	1.50	@	1.60
No. 4	.60	@	.65
No. 5A	.60	@	.65

Foreign Rags

All prices nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	@	2.20
New Light Silesias	5.50	@	5.75
Light Flannelettes	5.50	@	5.75
New White Cuttings	7.00	@	7.50
New Light Oxford	4.00	@	4.50
New Light Prints	3.00	@	3.25

Old Rags

No. 1 White Linens	7.50	@	8.50
No. 2 White Linens	6.50	@	7.50
No. 3 White Linens	4.50	@	—

HIGHEST QUALITY CLAYS

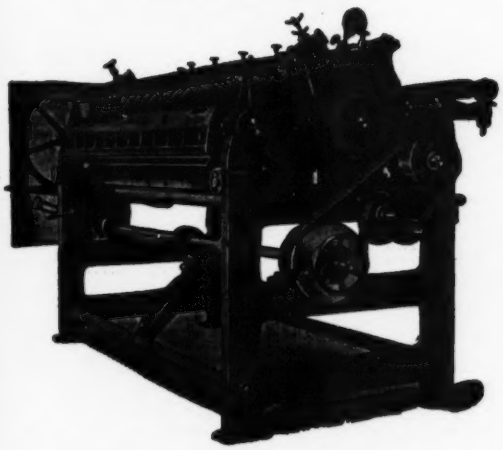
LUMP and POWDERED } IMPORTED — DOMESTIC { CRUDE CRUSHED, AIR FLOATED, WATER WASHED

EASTON PAPER MAKERS IMPORTING CO. INC. EASTON, PENNSYLVANIA, U.S.A.

PRECIPITATED CALCIUM CARBONATE

MODEL 28

ROLLER BEARING CUTTER



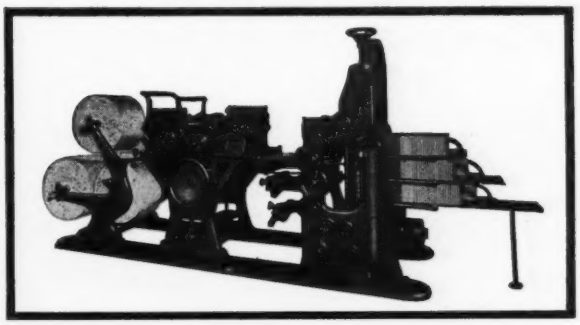
HAMBLET MACHINE CO.

LAWRENCE, MASS.

MAKERS OF

SINGLE, DUPLEX AND DIAGONAL PAPER CUTTERS
CUTTER KNIVES. PATENT TOP SLITTERS.

HIGH SPEED



NAPKIN FOLDER

It makes them all — plain, embossed and printed — quarter fold, dispenser fold, sixteenth fold and eighth fold. From 1,000 to 2,000 per minute — every napkin perfectly folded and delivered in a smooth, clean pack ready for wrapping. Used by every large producer in the United States and many foreign countries.

HUDSON-SHARP

MACHINE CO • GREEN BAY • WIS

CAMACHINES
HAVE
SPEED TO SPARE
Due to time-saving features which tend to lessen idle periods, CAMACHINE Winders keep comfortably ahead of the fastest running paper machines while seldom utilizing the high speeds of which they are capable.
CAMERON MACHINE COMPANY • 61 Poplar Street • BROOKLYN, N. Y.

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	@	4.75
No. 2 White Cotton.	3.25	@	3.75
No. 3 White Cotton.	2.50	@	3.00
No. 4 White Cotton.	1.90	@	2.20
Extra Light Prints..	2.00	@	2.40
Ord. Light Prints...	1.75	@	2.15
Med. Light Prints...	1.55	@	1.95
Dutch Blue Cottons.	2.25	@	2.50
French Blue Linens..	3.00	@	—
Checks and Blues...	2.00	@	—
Linsey Garments....	1.90	@	2.00
Dark Cottons.....	1.50	@	1.60
Old Shopperies.....	1.30	@	1.45
New Shopperies.....	1.45	@	1.50
French Blues.....	2.25	@	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.25	@	2.50
Domestic	1.75	@	2.00
Wool Tares, light...	1.75	@	2.00
Wool Tares, heavy..	1.80	@	1.90
Bright Bagging.....	1.75	@	1.90
Manila Rope—			
Foreign	3.50	@	4.00
Domestic	3.00	@	3.50
Jute Threads.....	3.00	@	3.25
Sisal Strings	1.50	@	1.60
Mixed Strings....	.55	@	.60

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.75	@	3.00
Ordinary Hard White No. 1....	2.25	@	2.50
Soft White No. 1..	1.70	@	1.80
Soft White Extra..	2.25	@	2.40
Flat Stock—			
Stitchless	1.10	@	1.25
Overissue Mag....	1.00	@	1.10
Solid Flat Book...	.90	@	1.00
Crumbled No. 1...	.40	@	.45
Ledger Stock White.	1.55	@	1.65
Ledger Stock Colored	1.05	@	1.15
Manila—			
New Env. Cut....	1.70	@	1.80
New Cuttings.....	1.40	@	1.50
Old Kraft Machine—Compressed bales..	1.00	@	1.10
News—			
No. 1 White News	1.75	@	1.90
Strictly Overissue.	.70	@	.75
Strictly Folded....	.60	@	.65
Corrugated	.65	@	.75
No. 1 Mixed Paper..	.55	@	.60

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18½	@	—
White Hemp.....	.18½	@	—
Fine Polished—			
Fine India.....	.23	@	—
Unpolished—			
Box	.14¾	@	—
Paper Makers.....	.15	@	—
Tube Rope.....	.16¼	@	—
Wall Paper.....	.15¾	@	—
Wrapping	.18	@	—
Soft Fiber Rope...	.16¼	@	—
Cotton	.21	@	—
(Hard Fiber)			
Medium Java.....	.19	@	—
Mex. Sisal.....	.16	@	—
Manila	.24	@	—

Domestic	4.00	@	4.50
Sisal Rope.....	2.00	@	2.25
Mixed Rope.....	1.00	@	1.10
Transmission Rope..	3.00	@	—
Soft Jute Rope.....	2.50	@	2.60
Jute Carpet Threads.	1.25	@	1.50
Gunny Bagging—			
Foreign	2.25	@	—
Domestic	2.00	@	2.10
Bleachery Burlap....	3.00	@	3.50
Scrap Burlap—			
Foreign .....(nominal)			
Domestic	1.62½	@	1.75
Scrap Sisal.....	1.90	@	2.00
Scrap Sisal for Shredding	2.25	@	2.50
Wool Tares, Heavy..	1.40	@	1.50
New Burlap Cuttings	3.00	@	3.12½
Aust. Wool Pouches.	2.50	@	3.00
Heavy Baling Bagging	2.00	@	2.25
Paper Mill Bagging..	1.25	@	1.50
No. 2 Bagging.....	1.25	@	1.30

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1....	.07	@	.07¼
New Light Flannelettes	.05	@	—
Silesias No. 1.....	.04	@	.04¼
New Black Silesias..	.03½	@	.03¾
Soft Unbleached.....	7.50	@	8.00
Blue Cheviots.....	.05½	@	.06
Fancy	.02	@	.02½
Washable	.02	@	.02½
Cottons—According to grades—			
Blue Overalls.....	.05¼	@	.05½
New Black, sort...	.03¼	@	.04
Khaki Cuttings.....	.02½	@	.03
O. D. Khaki.....	.03	@	.03¼
Corduroy	.02¼	@	.03
New Canvas.....	.06¼	@	.07¼
B. V. D. Cuttings...	.07	@	.07¼

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues.....	2.25	@	2.50
Old Blue Overalls...	1.60	@	2.00
Thirds and Blues—			
Repacked	2.00	@	2.25
Miscellaneous	1.50	@	1.60
Black Stockings.....	4.00	@	4.25
Roofing Stock—			
No. 1.....	1.75	@	2.00
No. 2.....	1.60	@	1.65
No. 3.....	1.00	@	1.25

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phil.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White, No. 2.	.04	@	.04½
Light Silesias.....	—	@	.04½
Silesias, No. 1....	—	@	.04½
Black Silesias, soft	—	@	.03¾
New Unbleached..	.05½	@	.06
Washable, No. 1..	—	@	.04
Blue Overall.....	—	@	.05
Cottons—According to grades—			
Washable No. 2...	—	@	.02
New Blue.....	—	@	.02
Fancy Percales....	—	@	.03
New Black Soft...	—	@	.04
New Light Seconds	.04½	@	.05
New Dark Seconds	—	@	1.50
Khaki Cuttings—			
No. 1 O. D.....	.03½	@	.04
No. 2 Mixed.....	.03	@	.03¼
Corduroy	—	@	.02½
New Canvas.....	.05½	@	.06
New Black Mixed.	—	@	03

Domestic Rags (Old)

White No. 1—			
Repacked	3.50	@	4.00
Miscellaneous	2.75	@	3.00
Thirds and Blues—			
Miscellaneous	2.00	@	2.25
Repacked	2.50	@	2.75
Black Stockings (Export)	3.50	@	4.00
Roofing Stock—			
Foreign No. 1.....Nominal			
Domestic No. 1...	1.50	@	1.60
Domestic No. 2...	1.35	@	1.45
Roofing Bagging..	—	@	1.30

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.50	@	3.00
Manila Rope.....	—	@	4.50
Sisal Rope.....	1.75	@	2.00
Mixed Rope.....	1.25	@	1.50
Scrap—			
No. 1.....	2.25	@	2.50
No. 2.....	—	@	1.40
Wool Tares, heavy..	3.50	@	3.70
Mixed Strings.....	.75	@	1.00
No. 1 New Light Burlap	3.00	@	3.50
New Burlap Cuttings	2.00	@	2.25

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White	2.25	@	2.30
No. 2 Hard White	2.00	@	2.10
No. 1 Soft White.	1.75	@	1.80
No. 2 Soft White.	1.40	@	1.50
No. 1 Mixed.....	.90	@	1.00
Solid Ledger Stock..	1.50	@	1.60
Ledger Stock, white.	1.30	@	1.35
Ledger Stock, colored	1.00	@	1.10
No. 1 Books, heavy..	.80	@	.90
Manila Cuttings.....	1.90	@	2.00
Print Manila.....	.70	@	.75
Container Manila....	.65	@	.70
Kraft Paper.....	1.00	@	1.10
No. 1 Mixed Paper..	.55	@	—
Straw Board Chip...	.50	@	—
Binders Board Chip..	.50	@	—
Corrugated Board...	.60	@	.65
Overissue News.....	.70	@	.75
Old Newspapers.....	.65	@	.70

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White.	1.85	@	2.15
No. 2 Mixed.....	.75	@	.80
Solid Ledger Books..	1.30	@	—
Overissue Ledger Stock	1.30	@	1.50
Mixed Ledgers	.85	@	.90
No. 1 Books, heavy.	1.00	@	1.10
No. 1 Books, light..	.65	@	.75
Crumpled Stitchless Book Stock.....	.55	@	.65
Manila Env. Cuttings	1.70	@	1.85
Manila Envelope Cuttings, Extra Quality	2.25	@	2.50
No. 1 Old Manila...	.80	@	.90
White Blank News..	1.30	@	1.40
No. 1 Kraft.....	1.10	@	1.20
Mixed Papers.....	.52½	@	.55
Print Manila	.70	@	.75
Container Manila....	.60	@	.70
Old Newspapers.....	.60	@	.65
Paper Wool Strings.	.80	@	.90
Overissue News.....	.70	@	.75
Box Board Chips....	.52½	@	.55
Corrugated Boxes...	.57½	@	.62½
Kraft corrugated boxes	1.10	@	1.20
Screening Wrappers.	.60	@	.70

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	4.00	@	—

CHICAGO

Old Papers

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings....	2.10	@	2.25
No. 1 Hard White.	2.00	@	2.15
No. 1 Soft White..	1.75	@	1.90
Ledger & Writings..	1.35	@	1.45
Solid Books.....	1.05	@	1.20
Blanks	1.50	@	1.60
Krafts	.90	@	1.00
Manila Env. Cuts...	Nominal		
Ex. No. 1 Manila...	Nominal		
Print Manila	Nominal		
Overissue News.....	.62¼	@	.65
Old Newspapers—			
No. 1 Folded News	.67½	@	.70
No. 1 Mixed Paper	.57½	@	.60
Roofing Stocks—			
No. 1.....	1.25	@	1.30
No. 2.....	1.15	@	1.20

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots

No. 1 White $35.50		@	—
No. 1 Tints	36.50	@	—
No. 2 White	25.50	@	—
No. 2 Tints	26.50	@	—
No. 2 Golden Rod..	27.50	@	—
No. 3 White	21.00	@	—
No. 4 White	15.00	@	—
No. 4 Tints	16.00	@	—
No. 4 Golden Rod...	17.00	@	—
Direct mill shipment in three-ton lots			
No. 5 White $10.50		@	—
No. 5 Tints	11.50	@	—
No. 5 Golden Rod..	12.00	@	—
No. 6 White	9.00	@	—
No. 6 Tints	9.50	@	—
No. 6 Golden Rod..	11.00	@	—
No. 7 White	8.00	@	—
No. 7 Tints	8.50	@	—
No. 7 Golden Rod..	10.00	@	—
Book—			
No. 1 M. F.	$7.00	@	—
No. 2 M. F.	6.50	@	—
No. 3 M. F.	5.35	@	—
No. 1 S. C.	7.25	@	—
No. 2 S. C.	6.75	@	—
No. 3 S. C.	5.85	@	—

Coated Book & Litho

Ton Lots (resale)

No. 1 .....$12.00		@	—
No. 2	10.25	@	—
No. 3	8.90	@	—
Coated tinted	13.00	@	—
Wrapping—delivered—			
Rag Brown.....$4.85		@	5.25
White Wrap.....	4.00	@	—
"B" Manila.....	4.90	@	6.15
No. 1 Manila.....	5.50	@	6.90
Fiber	5.50	@	6.90
Kraft No. 2.....	5.50	@	6.90

(F. o. b. Cars, Toronto)

News per ton—			
Rolls (contract)..)46.00		@	—
Sheets 54.00		@	—

Pulp

Ground wood.....$32.00		@	36.00
Unbleached sulphite.	44.00	@	—
Bleached sulphite...	54.00	@	—
Kraft	50.00	@	—
Soda	54.00	@	—

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut...	2.00	@	—
Soft White.....	1.75	@	—
White Blk. News..	1.25	@	1.10
Book and Ledger—			
Flat Magazine and Book Stock (old)	.70	@	—
Light and Crumpled Book Stock.	.60	@	—
Ledgers and Writings	1.00	@	—
Manilas—			
New Manila Cut...	1.35	@	—
Printed Manilas...	.45	@	—
Kraft	.95	@	—
News and Scrap—			
Strictly Overissue..	.50	@	—
Strictly Folded....	.45	@	—
No. 1 Mixed Paper..	.30	@	—

Domestic Rags

(Price to Mills, f.o.b. Toronto)

No. 1 White Shirt Cuttings	.07	@	.07¼
Light Prints.....	.03¼	@	.03½